Discrete Mathematics Objectives

ICT 7th sem

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Unit-1

Relation and Diagraph

Objectives

1. Relations may exist between
   a) objects of the same set
   b) between objects of two or more sets
   c) Both a and b
   d) None of the above

2. A binary relation R on a single set A is a subset of?
   a) A x A
   b) A ÷ A
   c) A ↑ A
   d) A ? A

3. For two distinct sets, A and B, having cardinalities m and n respectively, the maximum cardinality of a relation R from A to B is?
   a) m + n
   b) m * n
   c) m ^ n
   d) none of the above

4. A relation can be represented using a?
   a) Undirected graph
   b) Pie graph
   c) Directed graph
   d) Line graph

5. The ___ relation between the sets X and Y is the set X * Y.
   a) Empty
   b) Full
   c) Identity
   d) Inverse

6. A relation R on set A is called ___ if xRy implies yRx.
a) Irreflexive
b) Reflexive
c) Anti-Symmetric
d) Symmetric ✓

7. The relation R = {(a,b),(b,a)} on set X = {a,b} is ?
a) Irreflexive ✓ b) Reflexive
c) Anti-Symmetric d) Symmetric

8. The Binary relation {(1,1),(2,1),(2,2),(2,3),(2,4),(3,1),(3,2)} on the set {1,2,3} is ___.
a) reflexive symmetric and transitive
b) irreflexive, symmetric and transitive
c) neither reflexive nor irreflexive but transitive ✓
d) irreflexive and antisymmetric

9. Consider the binary relation, A = {(a,b) | b = a-1 and a,b belongs to {1,2,3}}. The reflexive transitive closure of A is ?
a) {(a,b) | a >= b and a,b belongs to {1,2,3}} ✓
b) {(a,b) | a > b and a,b belongs to {1,2,3}}
c) {(a,b) | a <= b and a,b belongs to {1,2,3}}
d) {(a,b) | a = b and a,b belongs to {1,2,3}}

10. The time complexity of computing the transitive closure of a binary relation on a set of n elements should be ___.

a) $O(n)$ b) $O(\log n)$
c) $O(n13)$ d) $O(n12)$

11. Let A and B be two non-empty relations on sets.
Which of the following statements is false?
a) A and B are transitive $\Rightarrow A \cap B$ is transitive
b) A and B are symmetric $\Rightarrow A \cup B$ is symmetric
c) A and B are transitive $\Rightarrow A \cup B$ is not transitive
d) A and B are reflexive $\Rightarrow A \cap B$ is reflexive

12. Determine the characteristic of the relation aRb if $a^2 = b^2$.
a) Transitive and Symmetric
b) Reflexive and asymmetry
c) Trichotomy, antisymmetry and irreflexive
d) Symmetric, Reflexive and transitive

13. The number of equivalent relations of the set {1,2,3,4} is:
a) 4 b) 15 c) 16 d) 24

14. The universal relation $A \times A$ on A is:
a) an equivalente relation
b) anti-symmetric
c) a partial ordering relation
d) not symmetric and non-anti symmetric

15. If $A=\{1,2,3,4\}$. Let $\sim=\{(1,2),(1,3),(4,2)\}$. Then $\sim$ is
a) not anti-symmetric b) transitive
c) reflexive d) symmetric

16. Which of the following sets are empty?
a) $\{x : x=x\}$
b) $\{x : x \neq x\}$
c) $\{x : x = x^2\}$
d) $\{x : x \neq x^2\}$

17. R is a binary relation on a set S and R is reflexive if and only if ____.
a) $r(R)=R$ b) $s(R)=R$
c) $t(R)=R$ d) $f(R)=R$

18. The condition of a binary relation to be symmetric is—
a) $s(R)=R$ b) $R \cup R=R$
c) $R=R^c$ d) $f(R)=R$

19. The transitive closure of the relation $\{(0,1),(1,2),(2,4),(3,4),(5,3),(5,4)\}$ on the set $\{1,2,3,4,5\}$ is ____.
→ $\{(0,1),(0,2),(1,2),(2,2),(3,4),(5,3),(5,4)\}$

20. Among the properties (reflexivity, symmetry, antisymmetry, transitivity) the relation $R=\{(a,b) \in x^2 \mid a != b\}$ satisfies ____ property.
a) symmetry b) transitivity
c) antisymmetry d) reflexivity

21. The number of equivalent relation of the set $\{3, 6, 9, 12, 18\}$ is _____.

a) 4 b) 2^5
c) 22 d) 90

22. The binary relation $U = \phi$ (empty set) on set $A = \{11, 23, 35\}$ is _____.

a) Neither reflexive nor symmetric b) Symmetric & reflexive
c) Transitive & reflexive d) Transitive & Symmetric.

Unit-2

Counting and Combinatorics

1. How many even 4 digit whole numbers are there?
   a) 1358 b) 7250 c) 4500 d) 3600

2. In a multiple choice question paper of 15 questions, the answers can be A, B, C, D. The number of different ways of answering the question paper are ____.
   a) 65536×47 b) 194536×45
   c) 23650×49 d) 112387435

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

4. Neela has 12 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

5. How many five different numbers can be made from the digits 1 to 7 if repitition is allowed?
   a) 16807 b) 54629 c) 23467 d) 32354

6. Amit must choose a seven-digit PIN number and ~~even~~ 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

7. 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

8. The number of diagonals can be drawn in a hexagon is _____
a) 9 b) 32 c) 16 d) 21

9. 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

10. How many words 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

11. A number lock contains 6 digits. How many different zip codes can be made with the digits 0-9 if repitition 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

12. In how many ways can 10 boys be seated in a row having 28 seats such that no two friends occupy adjacent seats?
a) $^{15}P_5$ b) $^{9}P_{29}$ c) $^{19}P_{10}$ d) $^{15}P_7$

13. In how many ways can the letters of the word FOUNDRY be arranged such that the words always appear together?
a) $\frac{(8+3)!}{2!}$ b) $\frac{6!}{2!}$ c) $8! * 3!$ d) $\frac{4!}{8!}$

14. In 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 (8!) c) 40520 d) 40720

15. How many numbers of three digits can be formed with digits 1,3,5,7 and 9?
a) 983 b) 120 ($^5P_3$) c) 345 d) 5430

16. In how many ways 6 pens can be selected from 15 identical black pens?
a) 9+3! b) 21 c) 14! d) 1

17. Determine the number of ways of selecting one or more letters from the letters BBBBBB?
a) 6 b) 73 c) 23 d) 56

18. 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

19. 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

20. 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

21. In a get together party, every person shakes the hands of every other person. If there ~~are~~ were 90 handshakes in all, how many persons were present at the party?
a) 15 b) 14 c) 16 d) 17

Unit-3 The Fundamental Algorithms and Matrices

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

2. Out of the following, which property algorithm does not share?
a) Input b) finiteness
c) Generality d) Constancy

3. In ____ search, each element is compared with x till not found.
a) Binary b) Sequential
c) Merge d) None of the mentioned

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

5. To sort a list with n elements, the insertion sort begins with the ____ element.
a) first b) second c) Third d) fourth

6. ____ Comparison is required to sort the list 1,2,3...n using insertion sort.
a) $(n^2+n+2)/2$ b) $(n^3+n-2)/2$
c) $(n^2+n-2)/2$ d) $(n^2-n+2)/2$

7. The worst case occurs in linear search when ____
→ Item is the last element in the array or not there at all.

8. The operation of processing each element in the list is known as ___
a) Sorting b) Merging c) Inserting d) Traversal

9. The Complexity of Bubble sort algorithm is ___
a) O(n) b) O(log n) c) O(n²) d) O(n log n)

10. An algorithm is ___.
→ a process for solving a problem.

11. An algorithm which uses the past results and uses them to find the new results is ___
→ Dynamic programming algorithms

12. A complexity of algorithm depends upon ___
a) Time only b) Space Only
c) Both time and space d) None of the mentiond

13. An algorithm which uses all the possibilities unless results are satisfactory is and is generally is time-consuming is ___
→ Brute Force

14. For a recursive algorithm ___
→ a base case is not necesary

15. Optimizing the algorithm means ___
→ making the algorithm fast by time and compact by space

16. For an algorithm which is the most important characteristic that make it acceptable ____
a) Fast b) Compact
c) Correctness and Precision d) None of the above

17. An algorithm can be represented through ____
a) Flow charts b) Pseudo Codes
c) Instructions in Common language d) All of the above

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

19. The Complexity of linear Search algorithm is ____.
a) O(n) b) O(log n)
c) O(n²) d) O(n log n)

20. The Complexity of Binary Search algorithm is ____.
a) O(n) b) O(log n)
c) O(n²) d) O(n log n)

21. The complexity of merge sort algorithm is ____
a) O(n) b) O(log n)
c) O(n²) d) O(n lg n)

22. The Complexity of Bubble Sort algorithm is ____.
a) O(n) b) O(log n)
c) O(n²) d) O(n log n)

23. The Worst Case Complexity for of Insertion Sort is ___
a) O(n) b) O(log n)
c) O(n²) d) O(n log n)

24. The Complexity of Fibonacci Series is ___
a) O(2ⁿ) b) O(log n)
c) O(n²) d) O(n log n)

25. Which is used to measure the time Complexity of an algorithm Big O notation?
a) describe 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

26. If for an algorithm the time Complexity is given by O(1) then the Complexity of it is ___.
a) Constant b) Polynomial
c) exponential d) none of the mentioned

27. 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

28. 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

29. If for an algorithm the time Complexity is given by $O(n^2)$ then Complexity will be ____.
a) Constant b) Quadratic
c) exponential d) none of the mentioned

30. If for an algorithm the time Complexity is given by $O((3/2)^n)$ then Complexity will be ____.
a) Constant b) Quadratic
c) exponential d) none of the mentioned.

31. The time Complexity of Binary Search is given by ____
a) $O(\log_2 n)$ b) $O(1)$
c) exponential d) none of the mentioned

32. Which algorithm is better for sorting between bubble sort and quick sort?
a) bubble sort b) quick sort
c) both are equally good d) none of the mentioned

33. Time Complexity of the binary search algorithm is Constant
a) True b) False

34. A symmetric matrix is one in which ?
a) All diagnol elements are zero
b) All diagnol elements are 1
c) $A = A^T$
d) $A = -A^T$

35. A matrix having one row and many column is ____
→ Row matrix

36. A matrix having many rows and one column is ___.
→ Column matrix

37. A square matrix $A=[a_{ij}]_{n\times n}$, if $a_{ij}=0$ for $i>j$ then that matrix is known as ___
a) Upper triangular matrix b) Lower triangular matrix
c) Unit matrix d) Null matrix

38. A square matrix $A=[a_{ij}]_{n\times n}$, If $a_{ij}=0$ for $i<j$ then the matrix is known as ___
→ Lower triangular matrix

39. Two matrices can be added if ___.
→ both rows and columns of both the matrices are same

40. For matrix A if $AA^T=I$, I is identity matrix then A is ?
a) Orthogonal matrix b) Nilpotent matrix
c) Idempotent matrix d) None of the mentioned

41. For a matrix A, if a matrix B is obtained by changing its rows into columns and column into rows, then relation between A and B is
a) $A^2=B$ b) $A^T=B$
c) Depends on matrix d) None of the mentioned

42. For matrix A, $(A^T)^T$ is equal to ___.
a) A b) A^T
c) Can't say d) None of the mentioned

43. For matrix A and a scalar k, $(kA)^T$ is equal to ___
a) $k(A)$ b) $k(A)^T$ c) $k^2(A)$ d) $k^2(A)^T$

44. If A is a lower triangular matrix then A^T is a ___
→ Upper triangular matrix

45. If matrix A and B are symmetric and $AB = BA$ iff ___
→ AB is a symmetric matrix

46. A matrix can be expressed as sum of symmetric and anti-symmetric matrices.
a. True b) False

47. Let $A = [a_{ij}]$ given by $a_{ij} = (i-j)^3$ is a ___
a) Symmetric matrix b) Anti-Symmetric matrix
c) Identity matrix d) None of the mentioned

48.

Unit-4 Recursion on Sequence and Series

1. ____ recursion consist of multiple self-references.
a) binary recursion b) Single recursion
c) multiple recursion d) Conductive recursion

2. In which of the following problems recurrence relation holds?
a) Optimal Structure b) Tower of Hanoi
c) Hallmark Substitution d) Longest Common Subsequence

3. 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

4. For the sequence 1, 7, 25, 79, 241, 727... simple formula for $\{a_n\}$ is —
a) $3^{n+1} - 2$ b) $3^n - 2$
c) $(-3)^n + 4$ d) $n^2 - 2$

5. The value of $\sum_{k=50}^{100} k^2$ is —
a) 338,350 b) 297,900
c) 297,925 d) 290,025

6. For the sequence $a_n = \lceil \sqrt{2n+1}/2 \rceil$, a_7 is —
a) 1 b) 7 c) 5 d) 4

7. For the sequence $a_n = 6.(1/3)^n$, a_4 is —
a) 2/25 b) 2/27 c) 2/19 d) 2/13

8. Let the sequence be 1,3,5,7,9... then this sequence is
→ an arithmetic sequence

9. In the given AP series. find the number of terms.
5, 8, 11, 14, 17, 20 50
a) 11 b) 13 c) 15 d) None of the mentioned

10. In the given AP series the term of position 11 would be?
5, 8, 11, 14, 17, 20 ... 50
a) 35 b) 45 c) 25 d) None of the mentioned

11. For the given Arithmetic progression find the position of first negative term?
50, 47, 44, 41 ....
a) 17 b) 20 c) 18 d) None of the mentioned

12. For the given AP find the first negative term.?
50, 47, 44, 41 ....
a) -1 b) -2 c) -3 d) none of the mentioned

13. Which of the following sequences in AP will have common difference 3, where n is an integer?
a) $a_n = 2n^2 + 3n$ b) $a_n = 2n^2 + 3$
c) $a_n = 3n^2 + 3n$ d) $a_n = 5 + 3n$

14. If a, b, c are in AP then relation between a, b, c can be —
a) $2b = 2a + 3c$ b) $2a = b + c$
c) $2b = a + c$ d) $2c = a + c$

15. Let the sum of 3 consecutive terms in AP be 180 then middle of these 3 terms would be ___.

a) 60 b) 80 c) 90 d) 179

16. Let the sequence be 2, 8, 32, 128 ... then this sequence is ___.

→ a geometric ~~seq~~ progression

17. In the given geometric progression find the number of terms.

32, 256, 2048, 16384 ... 2^{50}

a) 11 b) 13 c) 15 d) None of the mentioned

18. For the given Geometric progression find the position of first fractional term?

$2^{50}, 2^{47}, 2^{44}$ ...

a) 17 b) 20 c) 18 d) None of the mentioned

19. For the given geometric progression find the first fractional term.

$2^{50}, 2^{47}, 2^{44}$ ...

a) 2^{-1} b) 2^{-2} c) 2^{-3} d) None of the mentioned

20. Which of the following sequences in G.P. will have common ratio 3, where n is an integer?

a) $g_n = 2n^2 + 3n$ b) $g_n = 2n^2 + 3$

c) $g_n = 3n^2 + 3n$ d) $g_n = 6(3^{n-1})$

21. If a, b, c are in G.P then relation between a, b, c can be ___.

→ $b = (ac)^{1/2}$

22. Let the multiplication of the 3 consecutive terms in G.P. be 8 then the middle of those 3 terms will be—
a) 2 b) 3 c) 4 d) 179

23. Let A_1, A_2 be two A.M's and G_1, G_2 be two G.M's between a and b, then $(A_1+A_2)/G_1G_2$ is equal to
a) $(a+b)/2ab$ b) $2ab/(a+b)$
c) $(a+b)/(ab)$ d) None of the mentioned

24. The series $a, (a+b)/2, b$ is an—
a) AP b) GP c) HP d) None of the mentioned

25. The series $a, (ab)^{1/2}, b$ is in—
a) AP b) GP c) HP d) None of the mentioned

26. If a_1, a_2, a_3 are in GP then $1/a_1, 1/a_2, 1/a_3$ are in—
a) AP b) GP c) HP d) None of the mentioned

27. The sum of first n natural numbers is given by—
a) $n(n+1)/2$ b) $n(n-1)/2$
c) $n^2(n+1)/2$ d) None of the mentioned

28. The sum of square of first n natural numbers is given by—
a) $n(n+1)(2n+1)/6$ b) $n(n-1)/2(2n+1)$
c) $n^2(n+1)(2n+1)/6$ d) None of the mentioned

29. The sum of cubes of the first n natural numbers is given by—
a) $\{n(n+1)/2\}^3$ b) $\{n(n-1)/2\}^2$
c) $\{n^2(n+1)/2\}^2$ d) None of above

30. Which of the following is a fibonacci series?
a) 0,1,2,3,4... b) 0,1,1,2,3,5...
c) 10,12,14,16... d) None of the mentioned

31. If $a_1, a_2, \ldots$ are in AP then $a_1^{-1}, a_2^{-1}, \ldots$ are in ___
a) An arithmetic sequence b) A geometric progression
c) Arithmetic-geometric progression d) None of the mentioned

32. The nth term of $1/3, 1/7, 1/11, 1/15, 1/19 \ldots$ is given by?
a) $1/35$ b) $1/36$ c) $1/39$ d) None of the mentioned

33. If for some number a and d, if first term is $1/a$, second term is $1/(a+d)$, third term is $1/(a+2d)$ and so on, then 5th term of the sequence is?
a) $a+4d$ b) $a-4d$ c) $1/(a+4d)$ d) None of the above

34. If a, b, c are in hp then a^{-1}, b^{-1}, c^{-1} are in ___
a) GP b) HP c) AP d) None of the mentioned

35. Which of the following gives the right inequality for AM, GM, HM?
a) AM >= HM >= GM b) GM >= AM >= HM
c) AM >= GM >= HM d) GM >= HM >= AM

36. For two numbers a, b HM between them is given by,
a) $(2b+2a)/3b$ b) $2ab/(a+b)$
c) $(a+b)/2ab$ d) $2b/(a+b)$

37. If A, G, H are the AM, GM, HM between a and b respectively then ____

a) A, G, H are in hp b) A, G, H are in gp

c) A, G, H are in ap d) None of the mentioned

Unit-5

Special Types of functions

1. The floor function map a real number to ___
a) smallest previous integer b) greatest previous integer
c) smallest following integer d) none of the mentioned

2. A ceil function map a real number to ___
→ smallest following integer

3. A function f(x) is defined as f(x) = x - [x], where [.] represents GIF then ___.
a) f(x) will be integral part of x
b) f(x) will be fractional part of x
c) f(x) will always be 0
d) none of the mentioned

4. Floor (2.4) + Ceil (2.6) is equal to
a) 4 b) 6 c) 5 d) none of the mentioned

5. For some integer n such that x<n≤x+1, ceil (x)<n.
a) True b) False

6. For some number x, floor(x) <= x <= ceil (x).
a) True b) False

7. If x and y are positive numbers both are less than one, then maximum value of floor (x+y) is ?
a) 0 b) 1 c) 2 d) -1

8. If x and y are positive numbers both are less than one, the maximum value of ceil (x+y) is ?
a) 0 b) 1 c) 2 d) -1

9. If x = floor(x) = ceil(x) then —
a) x is a fractional number
b) x is an integer
c) x is less than 1
d) none of the mentioned

10. Let n be some integer greater than 1, then floor((n-1)/n) is 1.
a) True b) false

Unit-6 Geometric Transformation

1. In which of the following transformation methods is the shape of the object not deformed?
   a) Translation b) Shearing
   c) Both a & b d) None of the above

2. Translation equation:
   $x_1 = x + T_x$
   $y_1 = y + T_y$
   What is another name for the Translation pair (T_x, T_y)?
   a) Shift Vector b) Shift Coordinates
   c) Translation points d) None of the above

3. What value of the rotation angle rotates the ~~value~~ object in clockwise direction?
   a) Positive Value b) Negative Value
   c) Value less than 180 degree d) All of the above

4. Which of the following transformation techniques is responsible for altering (either enlarging it or diminishing it) the size of the object?
   a) Translation b) Rotation
   c) Scaling d) None of the above

5. The term "transformation" refers to the process of applying a translation to an entity.
   a) It's being repositioned around a circle lone
   b) Repositioning it along with straight line paths
   c) Only A
   d) None of the above

6. ___ is a rigid body transformation that enables an entity to shift without deforming.
a) Rotation b) Translation
c) Only B d) None of the above

7. The Color transformation is performed in the centre of the process ___.
a) Dual Color model b) Single Color model
c) Rotation Color model d) None of the above

8. What is necessary to specify to generate rotation?
a) Specific distances between dx and dy
b) Rotation angle θ
c) Scaling
d) Repositioning

9. The transformation set is also known as, ___
a) Translation difference b) Rotation Color model
c) Color mapping functions d) None of these

10. A two-dimensional point is transformed by inserting ___.
a) Translation Vector b) Shift Vector
c) Translation distances d) Both A and B.

11. The transformation of the entity in relation to an axis is called the reflection ~~image~~ or image.
a) Reflection b) Translation
c) only A d) Only B

12. Which of the following is a matrix form of 2D translation equation is,
a) $P' = R * P$ b) $P' = P + R$
c) $P' = P / R$ d) None of the above

13. The fundamental geometric transformation are as follows:
a) Scaling b) Translation
c) Rotation d) All of the above

14. An efficient transformation method which produces a parallel mirror of an object is also referred as,
a) Rotation b) Reflection
c) Shear d) All of the above

15. A transformation method which may cause the change in shape of an object is referred as,
a) Rotation b) Scaling
c) Reflection d) Shear

16. Among which of the following most basic transformation methods which may be applied in three dimensional planes.?
a) Rotation b) Translation
c) Scaling d) All of the above

17. Which shape property is not guaranted in an isometric transformation?
a) Distance b) Angle
c) Collinearity d) Location

18. Isometric Transformations and Rigid motions:
a) are the same b) are opposites
c) have no relationship d) none of the above

19. Which of the following is not an isometric transformation?
a) Reflection b) Dilation
c) Rotation d) Translation

20. Which of the following is a non-isometric transformation?
a) $T(x,y) \rightarrow (x-4, y+3)$ b) $T(x,y) \rightarrow (y,x)$
c) $T(x,y) \rightarrow (2x, 2y)$ d) $T(x,y) \rightarrow (x-\sqrt{5}, y+\pi)$

21. Which of the following is a non-isometric transformation?
a) $T(x,y) \rightarrow (-y,x)$ b) $T(x,y) \rightarrow (x, 4y)$
c) $T(x,y) \rightarrow (-x,-y)$ d) $T(x,y) \rightarrow (-x+3, y+5)$

22. Which term describes a transformation that does not alter a figures shape or size?
a) Symmetry b) Similarity
c) Isometry d) Transformation

23.