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※ 문제 자체는 생략하고 문항번호와 답안만 작성하여 제출하기 바랍니다.

※(1~9) 다음 문장의 내용이 맞으면 ○표, 틀리면 ×표를 답하시오.

1. Let X=Y=$\mathbb{Z}$ and let formula $f(x)$ be defined by $f(x)=y$ and $y^2=x$, for $x\in X,\ y\in Y$. Then f(x) is a function. ×
2. If f is also everywhere defined and bijection, then f is called a one-to- one correspondence between A and B. ○
3. Let f and g be functions whose domains are subsets of $\mathbb{Z}^+$, positive integers. If f is $O(g)$, then f grows faster than g dose. ×
4. Let $(T,\ v_0)$ be a rooted tree. The vertices of same level is called the siblings. ×
5. Let $(T,\ v_0)$ be a rooted tree. Then, there are no cycles in T. v_0 is the only root of T. And all vertices of T has in-degree. ×
6. If $(T,\ v_0)$ is a rooted tree and $v\in T$, then $T(v)$ is also a rooted tree with root v. We will say that $T(v)$ is the subtree of T beginning at v. ○
7. If a graph G has exactly two vertices of odd degree, there is an Euler circuit in G. ×
8. The graph G is called the connected if there is a path from any vertex to any other vertex in G. ○
9. The graph is called complete if each vertex of the graph has the same degree as every other vertex. ×

※(10~16) 다음 괄호에 알맞은 값이나 용어를 채워 넣으시오.

10. Two cycles of a set A are said to be (disjoint) if no element of A appears in both cycles.
11. The vertices of the tree that have no offspring are called the (leaves) of the tree.
12. If all vertices of T, other than the leaves, have exactly 2 offsprings, we say that T is a complete (binary) tree.
13. Let R be a symmetric relation on a set A. R is connected and (acyclic).
14. If R is a symmetric, connected relation on a set A, we say that a tree T on A is a (spanning tree) for R if T is a tree with exactly the same vertices as R and which can be obtained from R by deleting some edges of R.
15. (weighted) graph is a graph for which each edge is labeled with a numerical value.
16. If a graph G is (Connected) and has exactly two vertices of odd degree, there is an Euler path in G.

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17. Let $f(x,y)=(3x-2y,\ 2x-3y),\ (x,\ y)\in \mathbb{R}\times\mathbb{R}$. Find f^{-1}.

$f(1,0)=(3,2),\ f(3,2)=(5,0)$
$f(2,1)=(4,1),\ f(4,1)=(10,5)$
$f(3,2)=(5,0),\ f(5,0)=(15,10)$

$f^{-1}=\left(\frac{3x-2y}{5},\ \frac{2x-3y}{5}\right)$

18. Consider the following functions.

$f_1(n)=2.3^n+n^3$, $f_2(n)=15\,n\lg(n)$, $f_3(n)=15{,}632$,
$f_4(n)=2.3\lg(n)+10$, $f_5(n)=2n^4-3n^3+2n$, $f_6(n)=1.35n^5+3n^2$

(1) Give the Θ-class of the functions.

(2) Order the functions according to their Θ-class from the lowest to the highest.

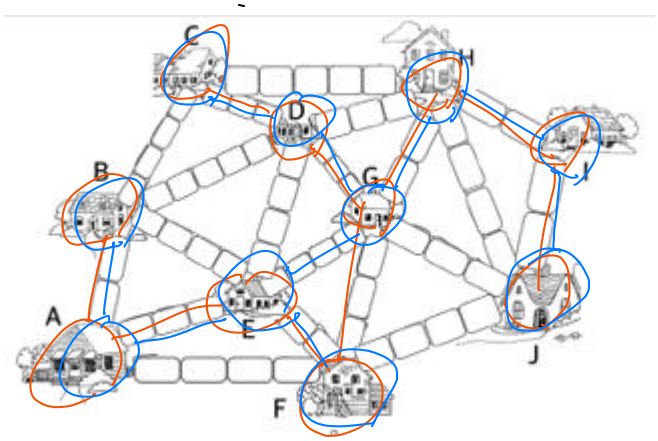
19. Let $A = \{1, 2, 3, 4, 5, 6, 7\}$ and a permutation p of A follow as $p = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 7 & 3 & 6 & 5 & 4 & 2 & 8 & 1 \end{pmatrix}$

(1) Compute p^{-1}.

(2) Write the permutation p as a product of disjoint cycles of length ≥ 2.

(3) Is the permutation p even or odd?

20. The people constructs the waterway in the city. The waterway link from A in all houses. The waterway link from A in all houses. When link the waterway, possibility of the pipe which is necessary with the following figure. Assume that construction costs of pipe are the same on all parts of the system. And the construction cost of one pipe is $30,000.



(1) Use Prim's algorithm to find the link method of the waterway as cheaply as possible. List the edges in the order of your selection starting from the node A. [2 points]

(2) Use Kruskal's algorithm to find the link method of the waterway as cheaply as possible. List the edges in the order of your selection.

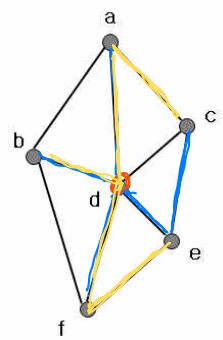
(3) Calculate the total construction cost of waterway.

21. Let T be an n-tree of height k.

(1) What is the maximum number of vertices in T?

(2) What is the largest possible number of leaves in T(n=k=4)?

22. Let G be the graph shown in the figure. How many are all spanning trees of G? [3 points]



가능한 경우 개수:
5 edge : 1가지
4 edge : 10가지
3 edge :

***** 문제를 제외하고 답안만 작성하며, 뒷면을 사용하여 가급적 한 장으로 제출하기 바랍니다. *****