Serial Number: **500**, Answers: 1: 2: 3: 4: 5: 6: 7: 8: 9:
Name:

University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 10! B: 3^{11} C: 11! D: 9!

Question 2: A bipartite graph G with vertex sets A and B is r-regular. That is all its vertices have the same degree r. Then
A: For every subset $J \subseteq A$ the set of all its neighbors has more elements than J. B: side B has more vertices than side A. C: side A has more vertices than side B. D: there is always a perfect matching of the vertices of side A.

Question 3: How many different functions are there from the set $\{1, \ldots, m\}$ to the set $\{1, \ldots, n\}$?
A: n^m B: m^n C: $n(n-1)\cdots(n-m+1)$ D: $m \cdot n$

Question 4: The binomial coefficient $\binom{n}{k}$ equals
A: 0 if $k = 0$. B: $\binom{n}{n-k}$.

Question 5: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
A: 20^3 B: $\frac{20!}{3!}$ C: $20 \cdot 19 \cdot 18$ D: 3^{20}

Question 6: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$ B: $10 \cdot 9 \cdot 8 \cdot 7$

Question 7: The number of edges of the complete bipartite graph K_{mn}, with vertex sets $A = \{a_1, \ldots, a_m\}$ and $B = \{b_1, \ldots, b_n\}$ is
A: $2(m+n)$ B: $m+n$ C: $m(n-1) + n(m-1)$ D: $m \cdot n$

Question 8: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 2^{10} B: 10×10 C: 10! D: 11!

Question 9: In a bipartite graph with vertex sets A and B which has a perfect matching of side A
A: each vertex of side B is connected to some vertex in side A. B: the number of vertices of side B is at least the number of vertices of side A. C: the number of vertices of side A is at least the number of vertices of side B. D: each vertex of side A is connected with all vertices of side B.

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Serial Number: **501**, Answers: 1: 2: 3: 4: 5: 6: 7: 8: 9:
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Final examination

Question 1: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: 3^{10} *B*: $10 \cdot 9 \cdot 8$ *C*: 10^3 *D*: 30

Question 2: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 2^{10} *B*: 10×10 *C*: 10! *D*: 11!

Question 3: In a simple graph with 100 vertices
A: not all vertex degrees can be odd. *B*: the minimum vertex degree is ≥ 1. *C*: it is possible that all vertices have different degrees. *D*: the maximum vertex degree is ≤ 99.

Question 4: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$ *B*: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$

Question 5: If A is the adjacency matrix of the simple graph G with vertex set $V = \{1, 2, \ldots, n\}$, then the entry $A_{i,j}$, with $i, j \in V$ is
A: equal to the degree of vertex i *B*: equal to 1 exactly when there is a path that connect i to j. *C*: equal to 1 exactly when i is not connected to j *D*: equal to 0 exactly when i is not connected to j

Question 6: How many different functions are there from the set $\{1, \ldots, m\}$ to the set $\{1, \ldots, n\}$?
A: n^m *B*: $m \cdot n$ *C*: $n(n-1)\cdots(n-m+1)$ *D*: m^n

Question 7: The binomial coefficient $\binom{n}{k}$ equals
A: $\binom{n}{n-k}$. *B*: 0 if $k = 0$.

Question 8: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: $\frac{10!}{6!}$ *B*: 6! *C*: $\frac{10!}{6!4!}$ *D*: 10^4

Question 9: If G is a connected simple graph with n vertices then
A: it cannot have more than $n+1$ edges. *B*: it must have at least $n-1$ edges. *C*: it must have at least n edges. *D*: it cannot contain cycles.

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Final examination

Question 1: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 10! B: 11! C: 9! D: 3^{11}

Question 2: The binomial coefficient $\binom{n}{k}$ equals
A: $\binom{n}{n-k}$. B: 0 if $k = 0$.

Question 3: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots2\cdot1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots2\cdot1}$

Question 4: If G is a simple graph then
A: it has at most two vertices with odd degree. B: it has at least two vertices with odd degree. C: the number of its vertices with odd degree is not odd. D: the number of its vertices with even degree is even.

Question 5: In a simple graph with 100 vertices
A: not all vertex degrees can be odd. B: the maximum vertex degree is ≤ 99. C: the minimum vertex degree is ≥ 1. D: it is possible that all vertices have different degrees.

Question 6: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: $10 \cdot 9 \cdot 8$ B: 10^3 C: 3^{10} D: 30

Question 7: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: 2^n B: $2^n + 2^n$ C: 3^n D: $\binom{n}{n/2}$

Question 8: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: $\frac{10!}{6!4!}$ B: 6! C: $\frac{10!}{6!}$ D: 10^4

Question 9: A bipartite graph G with vertex sets A and B is r-regular. That is all its vertices have the same degree r. Then
A: there is always a perfect matching of the vertices of side A. B: side B has more vertices than side A. C: For every subset $J \subseteq A$ the set of all its neighbors has more elements than J. D: side A has more vertices than side B.

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University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 11! B: 10! C: 2^{10} D: 10×10

Question 2: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: $\binom{n}{n/2}$ B: 2^n C: 3^n D: $2^n + 2^n$

Question 3: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$ B: $10 \cdot 9 \cdot 8 \cdot 7$

Question 4: The binomial coefficient $\binom{n}{k}$ equals
A: 0 if $k = 0$. B: $\binom{n}{n-k}$.

Question 5: If G is a connected simple graph with n vertices then
A: it cannot have more than $n + 1$ edges. B: it cannot contain cycles. C: it must have at least $n - 1$ edges. D: it must have at least n edges.

Question 6: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 11! B: 3^{11} C: 10! D: 9!

Question 7: The number of edges of the complete bipartite graph K_{mn}, with vertex sets $A = \{a_1, \ldots, a_m\}$ and $B = \{b_1, \ldots, b_n\}$ is
A: $m \cdot n$ B: $2(m + n)$ C: $m(n - 1) + n(m - 1)$ D: $m + n$

Question 8: How many different functions are there from the set $\{1, \ldots, m\}$ to the set $\{1, \ldots, n\}$?
A: $n(n - 1) \cdots (n - m + 1)$ B: n^m C: $m \cdot n$ D: m^n

Question 9: In a simple graph with 100 vertices
A: the minimum vertex degree is ≥ 1. B: not all vertex degrees can be odd. C: it is possible that all vertices have different degrees. D: the maximum vertex degree is ≤ 99.

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Final examination

Question 1: If G is a connected simple graph with n vertices then
A: it must have at least $n-1$ edges. B: it cannot contain cycles. C: it must have at least n edges. D: it cannot have more than $n+1$ edges.

Question 2: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 9! B: 3^{11} C: 10! D: 11!

Question 3: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
A: 3^{20} B: $\frac{20!}{3!}$ C: 20^3 D: $20 \cdot 19 \cdot 18$

Question 4: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$

Question 5: How many different functions are there from the set $\{1, \ldots, m\}$ to the set $\{1, \ldots, n\}$?
A: m^n B: $m \cdot n$ C: $n(n-1)\cdots(n-m+1)$ D: n^m

Question 6: In a simple graph with 100 vertices
A: it is possible that all vertices have different degrees. B: not all vertex degrees can be odd. C: the maximum vertex degree is ≤ 99. D: the minimum vertex degree is ≥ 1.

Question 7: If G is a simple graph then
A: it has at most two vertices with odd degree. B: the number of its vertices with odd degree is not odd. C: the number of its vertices with even degree is even. D: it has at least two vertices with odd degree.

Question 8: The binomial coefficient $\binom{n}{k}$ equals
A: 0 if $k = 0$. B: $\binom{n}{n-k}$.

Question 9: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 2^{10} B: 11! C: 10! D: 10×10

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Final examination

Question 1: The number of edges of the complete bipartite graph K_{mn}, with vertex sets $A = \{a_1, \ldots, a_m\}$ and $B = \{b_1, \ldots, b_n\}$ is
A: $m \cdot n$ B: $2(m+n)$ C: $m+n$ D: $m(n-1)+n(m-1)$

Question 2: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
A: 3^{20} B: 20^3 C: $\frac{20!}{3!}$ D: $20 \cdot 19 \cdot 18$

Question 3: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 3^{11} B: $10!$ C: $11!$ D: $9!$

Question 4: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: 10^4 B: $6!$ C: $\frac{10!}{6!4!}$ D: $\frac{10!}{6!}$

Question 5: In a simple graph with 100 vertices
A: the minimum vertex degree is ≥ 1. B: it is possible that all vertices have different degrees. C: the maximum vertex degree is ≤ 99. D: not all vertex degrees can be odd.

Question 6: If G is a simple graph then
A: it has at least two vertices with odd degree. B: the number of its vertices with odd degree is not odd. C: it has at most two vertices with odd degree. D: the number of its vertices with even degree is even.

Question 7: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$

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Final examination

Question 1: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
A: 20^3 B: $20 \cdot 19 \cdot 18$ C: 3^{20} D: $\frac{20!}{3!}$

Question 2: In a bipartite graph with vertex sets A and B which has a perfect matching of side A
A: each vertex of side B is connected to some vertex in side A. B: each vertex of side A is connected with all vertices of side B. C: the number of vertices of side B is at least the number of vertices of side A. D: the number of vertices of side A is at least the number of vertices of side B.

Question 3: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
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A: $m(n-1) + n(m-1)$ B: $2(m+n)$ C: $m+n$ D: $m \cdot n$

Question 7: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: $\frac{10!}{6!}$ B: 10^4 C: $6!$ D: $\frac{10!}{6!4!}$

Question 8: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: $10 \cdot 9 \cdot 8$ B: 3^{10} C: 30 D: 10^3

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Final examination

Question 1: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: $\frac{10!}{6!4!}$ B: $\frac{10!}{6!}$ C: $6!$ D: 10^4

Question 2: The number of edges of the complete bipartite graph K_{mn}, with vertex sets $A = \{a_1, \ldots, a_m\}$ and $B = \{b_1, \ldots, b_n\}$ is
A: $m \cdot n$ B: $m(n-1) + n(m-1)$ C: $m + n$ D: $2(m + n)$

Question 3: The binomial coefficient $\binom{n}{k}$ equals
A: $\binom{n}{n-k}$. B: 0 if $k = 0$.

Question 4: If A is the adjacency matrix of the simple graph G with vertex set $V = \{1, 2, \ldots, n\}$, then the entry $A_{i,j}$, with $i, j \in V$ is
A: equal to 1 exactly when i is not connected to j B: equal to the degree of vertex i C: equal to 0 exactly when i is not connected to j D: equal to 1 exactly when there is a path that connect i to j.

Question 5: If G is a simple graph then
A: the number of its vertices with even degree is even. B: the number of its vertices with odd degree is not odd. C: it has at most two vertices with odd degree. D: it has at least two vertices with odd degree.

Question 6: How many different functions are there from the set $\{1, \ldots, m\}$ to the set $\{1, \ldots, n\}$?
A: m^n B: $n(n-1)\cdots(n-m+1)$ C: $m \cdot n$ D: n^m

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A: $11!$ B: $9!$ C: 3^{11} D: $10!$

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A: 10^3 B: 30 C: 3^{10} D: $10 \cdot 9 \cdot 8$

Question 9: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $10 \cdot 9 \cdot 8 \cdot 7$ B: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$

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Final examination

Question 1: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$

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Question 7: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
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Question 9: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
A: 3^{20} B: $20\cdot 19\cdot 18$ C: 20^3 D: $\frac{20!}{3!}$

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Question 1: If G is a simple graph then
A: it has at most two vertices with odd degree. B: the number of its vertices with even degree is even. C: it has at least two vertices with odd degree. D: the number of its vertices with odd degree is not odd.

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Question 9: If G is a connected simple graph with n vertices then
A: it must have at least n edges. B: it cannot contain cycles. C: it must have at least $n-1$ edges. D: it cannot have more than $n+1$ edges.

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Final examination

Question 1: If G is a connected simple graph with n vertices then
A: it cannot have more than $n+1$ edges. B: it must have at least $n-1$ edges. C: it cannot contain cycles. D: it must have at least n edges.

Question 2: If A is the adjacency matrix of the simple graph G with vertex set $V = \{1, 2, \ldots, n\}$, then the entry $A_{i,j}$, with $i, j \in V$ is
A: equal to the degree of vertex i B: equal to 1 exactly when i is not connected to j C: equal to 0 exactly when i is not connected to j D: equal to 1 exactly when there is a path that connect i to j.

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A: 20^3 B: 3^{20} C: $20 \cdot 19 \cdot 18$ D: $\frac{20!}{3!}$

Question 4: A bipartite graph G with vertex sets A and B is r-regular. That is all its vertices have the same degree r. Then
A: side B has more vertices than side A. B: For every subset $J \subseteq A$ the set of all its neighbors has more elements than J. C: side A has more vertices than side B. D: there is always a perfect matching of the vertices of side A.

Question 5: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: $6!$ B: 10^4 C: $\frac{10!}{6!}$ D: $\frac{10!}{6!4!}$

Question 6: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: $10!$ B: $11!$ C: 2^{10} D: 10×10

Question 7: The binomial coefficient $\binom{n}{k}$ equals
A: 0 if $k = 0$. B: $\binom{n}{n-k}$.

Question 8: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: 10^3 B: 3^{10} C: 30 D: $10 \cdot 9 \cdot 8$

Question 9: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$ B: $10 \cdot 9 \cdot 8 \cdot 7$

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Serial Number: **511**, Answers: 1: 2: 3: 4: 5: 6: 7: 8: 9:
Name:

University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: How many different functions are there from the set $\{1, \ldots, m\}$ to the set $\{1, \ldots, n\}$?
A: $n(n-1)\cdots(n-m+1)$ B: m^n C: $m \cdot n$ D: n^m

Question 2: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$

Question 3: A bipartite graph G with vertex sets A and B is r-regular. That is all its vertices have the same degree r. Then
A: side A has more vertices than side B. B: there is always a perfect matching of the vertices of side A. C: side B has more vertices than side A. D: For every subset $J \subseteq A$ the set of all its neighbors has more elements than J.

Question 4: If G is a simple graph then
A: it has at least two vertices with odd degree. B: the number of its vertices with odd degree is not odd. C: it has at most two vertices with odd degree. D: the number of its vertices with even degree is even.

Question 5: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 11! B: 9! C: 10! D: 3^{11}

Question 6: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: $\frac{10!}{6!4!}$ B: 10^4 C: 6! D: $\frac{10!}{6!}$

Question 7: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: 2^n B: $\binom{n}{n/2}$ C: 3^n D: $2^n + 2^n$

Question 8: In a bipartite graph with vertex sets A and B which has a perfect matching of side A
A: the number of vertices of side A is at least the number of vertices of side B. B: the number of vertices of side B is at least the number of vertices of side A. C: each vertex of side A is connected with all vertices of side B. D: each vertex of side B is connected to some vertex in side A.

Question 9: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $10 \cdot 9 \cdot 8 \cdot 7$ B: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$

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Name:

University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 10! B: 11! C: 2^{10} D: 10×10

Question 2: If G is a connected simple graph with n vertices then
A: it cannot have more than $n+1$ edges. B: it must have at least n edges. C: it must have at least $n-1$ edges. D: it cannot contain cycles.

Question 3: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: 10^4 B: $\frac{10!}{6!4!}$ C: 6! D: $\frac{10!}{6!}$

Question 4: The binomial coefficient $\binom{n}{k}$ equals
A: $\binom{n}{n-k}$. B: 0 if $k = 0$.

Question 5: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: 30 B: 10^3 C: 3^{10} D: $10 \cdot 9 \cdot 8$

Question 6: In a simple graph with 100 vertices
A: the maximum vertex degree is ≤ 99. B: not all vertex degrees can be odd. C: it is possible that all vertices have different degrees. D: the minimum vertex degree is ≥ 1.

Question 7: If A is the adjacency matrix of the simple graph G with vertex set $V = \{1, 2, \ldots, n\}$, then the entry $A_{i,j}$, with $i, j \in V$ is
A: equal to 1 exactly when there is a path that connect i to j. B: equal to 1 exactly when i is not connected to j C: equal to 0 exactly when i is not connected to j D: equal to the degree of vertex i

Question 8: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
A: 20^3 B: $\frac{20!}{3!}$ C: 3^{20} D: $20 \cdot 19 \cdot 18$

Question 9: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
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Question 2: The number of edges of the complete bipartite graph K_{mn}, with vertex sets $A = \{a_1, \ldots, a_m\}$ and $B = \{b_1, \ldots, b_n\}$ is
A: $m + n$ B: $m(n-1) + n(m-1)$ C: $m \cdot n$ D: $2(m+n)$

Question 3: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$

Question 4: How many different functions are there from the set $\{1, \ldots, m\}$ to the set $\{1, \ldots, n\}$?
A: m^n B: $m \cdot n$ C: n^m D: $n(n-1)\cdots(n-m+1)$

Question 5: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 3^{11} B: $10!$ C: $11!$ D: $9!$

Question 6: A bipartite graph G with vertex sets A and B is r-regular. That is all its vertices have the same degree r. Then
A: For every subset $J \subseteq A$ the set of all its neighbors has more elements than J. B: side B has more vertices than side A. C: there is always a perfect matching of the vertices of side A. D: side A has more vertices than side B.

Question 7: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
A: 3^{20} B: $\frac{20!}{3!}$ C: $20 \cdot 19 \cdot 18$ D: 20^3

Question 8: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 10×10 B: $11!$ C: $10!$ D: 2^{10}

Question 9: If G is a simple graph then
A: the number of its vertices with even degree is even. B: it has at most two vertices with odd degree. C: it has at least two vertices with odd degree. D: the number of its vertices with odd degree is not odd.

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University of Crete – Department of Mathematics – Discrete Mathematics I

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A: For every subset $J \subseteq A$ the set of all its neighbors has more elements than J. B: there is always a perfect matching of the vertices of side A. C: side A has more vertices than side B. D: side B has more vertices than side A.

Question 2: In a bipartite graph with vertex sets A and B which has a perfect matching of side A
A: each vertex of side A is connected with all vertices of side B. B: the number of vertices of side A is at least the number of vertices of side B. C: each vertex of side B is connected to some vertex in side A. D: the number of vertices of side B is at least the number of vertices of side A.

Question 3: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 11! B: 2^{10} C: 10×10 D: 10!

Question 4: If G is a simple graph then
A: the number of its vertices with even degree is even. B: it has at most two vertices with odd degree. C: it has at least two vertices with odd degree. D: the number of its vertices with odd degree is not odd.

Question 5: How many different functions are there from the set $\{1, \ldots, m\}$ to the set $\{1, \ldots, n\}$?
A: n^m B: m^n C: $m \cdot n$ D: $n(n-1)\cdots(n-m+1)$

Question 6: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 9! B: 11! C: 10! D: 3^{11}

Question 7: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $10 \cdot 9 \cdot 8 \cdot 7$ B: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$

Question 8: The binomial coefficient $\binom{n}{k}$ equals
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A: $\binom{n}{n/2}$ B: 3^n C: 2^n D: $2^n + 2^n$

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Serial Number: **515**, Answers: 1: 2: 3: 4: 5: 6: 7: 8: 9:
Name:

UNIVERSITY OF CRETE – DEPARTMENT OF MATHEMATICS – DISCRETE MATHEMATICS I

Final examination

Question 1: The binomial coefficient $\binom{n}{k}$ equals
A: 0 if $k = 0$. B: $\binom{n}{n-k}$.

Question 2: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: 10^3 B: 30 C: $10 \cdot 9 \cdot 8$ D: 3^{10}

Question 3: If G is a simple graph then
A: it has at least two vertices with odd degree. B: the number of its vertices with even degree is even. C: it has at most two vertices with odd degree. D: the number of its vertices with odd degree is not odd.

Question 4: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: $\frac{10!}{6!}$ B: $6!$ C: 10^4 D: $\frac{10!}{6!4!}$

Question 5: If A is the adjacency matrix of the simple graph G with vertex set $V = \{1, 2, \ldots, n\}$, then the entry $A_{i,j}$, with $i, j \in V$ is
A: equal to 1 exactly when there is a path that connect i to j. B: equal to 1 exactly when i is not connected to j C: equal to 0 exactly when i is not connected to j D: equal to the degree of vertex i

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A: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$ B: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$

Question 9: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 2^{10} B: 10×10 C: $11!$ D: $10!$

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Name:

University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
A: 20^3 B: $\frac{20!}{3!}$ C: 3^{20} D: $20 \cdot 19 \cdot 18$

Question 2: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: $\frac{10!}{6!4!}$ B: $6!$ C: 10^4 D: $\frac{10!}{6!}$

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Question 4: In a simple graph with 100 vertices
A: the minimum vertex degree is ≥ 1. B: the maximum vertex degree is ≤ 99. C: it is possible that all vertices have different degrees. D: not all vertex degrees can be odd.

Question 5: If G is a connected simple graph with n vertices then
A: it must have at least n edges. B: it cannot contain cycles. C: it cannot have more than $n+1$ edges. D: it must have at least $n-1$ edges.

Question 6: If G is a simple graph then
A: the number of its vertices with even degree is even. B: it has at least two vertices with odd degree. C: the number of its vertices with odd degree is not odd. D: it has at most two vertices with odd degree.

Question 7: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 2^{10} B: 10×10 C: $11!$ D: $10!$

Question 8: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $10 \cdot 9 \cdot 8 \cdot 7$ B: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$

Question 9: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: $10 \cdot 9 \cdot 8$ B: 3^{10} C: 30 D: 10^3

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Serial Number: **517**, Answers: 1: 2: 3: 4: 5: 6: 7: 8: 9:
Name:

University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: If G is a simple graph then
A: it has at least two vertices with odd degree. B: the number of its vertices with even degree is even. C: the number of its vertices with odd degree is not odd. D: it has at most two vertices with odd degree.

Question 2: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$ B: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$

Question 3: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 10×10 B: $11!$ C: $10!$ D: 2^{10}

Question 4: A bipartite graph G with vertex sets A and B is r-regular. That is all its vertices have the same degree r. Then
A: side B has more vertices than side A. B: For every subset $J \subseteq A$ the set of all its neighbors has more elements than J. C: side A has more vertices than side B. D: there is always a perfect matching of the vertices of side A.

Question 5: The number of edges of the complete bipartite graph K_{mn}, with vertex sets $A = \{a_1, \ldots, a_m\}$ and $B = \{b_1, \ldots, b_n\}$ is
A: $m \cdot n$ B: $m + n$ C: $m(n-1) + n(m-1)$ D: $2(m + n)$

Question 6: The binomial coefficient $\binom{n}{k}$ equals
A: $\binom{n}{n-k}$. B: 0 if $k = 0$.

Question 7: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: 10^4 B: $\frac{10!}{6!4!}$ C: $6!$ D: $\frac{10!}{6!}$

Question 8: How many different functions are there from the set $\{1, \ldots, m\}$ to the set $\{1, \ldots, n\}$?
A: $n(n-1)\cdots(n-m+1)$ B: n^m C: $m \cdot n$ D: m^n

Question 9: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: $\binom{n}{n/2}$ B: 2^n C: 3^n D: $2^n + 2^n$

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University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: A bipartite graph G with vertex sets A and B is r-regular. That is all its vertices have the same degree r. Then
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Question 2: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
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A: each vertex of side B is connected to some vertex in side A. B: the number of vertices of side A is at least the number of vertices of side B. C: each vertex of side A is connected with all vertices of side B. D: the number of vertices of side B is at least the number of vertices of side A.

Question 6: How many different functions are there from the set $\{1, \ldots, m\}$ to the set $\{1, \ldots, n\}$?
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University of Crete – Department of Mathematics – Discrete Mathematics I

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A: 3^{20} B: $\frac{20!}{3!}$ C: $20 \cdot 19 \cdot 18$ D: 20^3

Question 9: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 11! B: 10! C: 9! D: 3^{11}

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Serial Number: **520**, Answers: 1: 2: 3: 4: 5: 6: 7: 8: 9:
Name:

University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

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A: $2(m+n)$ B: $m(n-1) + n(m-1)$ C: $m \cdot n$ D: $m+n$

Question 5: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 10! B: 3^{11} C: 9! D: 11!

Question 6: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 2^{10} B: 10×10 C: 10! D: 11!

Question 7: In a bipartite graph with vertex sets A and B which has a perfect matching of side A
A: each vertex of side A is connected with all vertices of side B. B: the number of vertices of side A is at least the number of vertices of side B. C: each vertex of side B is connected to some vertex in side A. D: the number of vertices of side B is at least the number of vertices of side A.

Question 8: How many different functions are there from the set $\{1, \ldots, m\}$ to the set $\{1, \ldots, n\}$?
A: m^n B: $n(n-1)\cdots(n-m+1)$ C: $m \cdot n$ D: n^m

Question 9: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$ B: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$

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UNIVERSITY OF CRETE – DEPARTMENT OF MATHEMATICS – DISCRETE MATHEMATICS I

Final examination

Question 1: In a bipartite graph with vertex sets A and B which has a perfect matching of side A
A: the number of vertices of side A is at least the number of vertices of side B. B: each vertex of side B is connected to some vertex in side A. C: the number of vertices of side B is at least the number of vertices of side A. D: each vertex of side A is connected with all vertices of side B.

Question 2: A bipartite graph G with vertex sets A and B is r-regular. That is all its vertices have the same degree r. Then
A: side A has more vertices than side B. B: there is always a perfect matching of the vertices of side A. C: side B has more vertices than side A. D: For every subset $J \subseteq A$ the set of all its neighbors has more elements than J.

Question 3: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 11! B: 9! C: 10! D: 3^{11}

Question 4: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
A: $20 \cdot 19 \cdot 18$ B: 3^{20} C: 20^3 D: $\frac{20!}{3!}$

Question 5: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$

Question 6: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: $10 \cdot 9 \cdot 8$ B: 30 C: 3^{10} D: 10^3

Question 7: The binomial coefficient $\binom{n}{k}$ equals
A: $\binom{n}{n-k}$. B: 0 if $k = 0$.

Question 8: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: $\frac{10!}{6!}$ B: $\frac{10!}{6!4!}$ C: 10^4 D: 6!

Question 9: If G is a simple graph then
A: it has at least two vertices with odd degree. B: the number of its vertices with even degree is even. C: it has at most two vertices with odd degree. D: the number of its vertices with odd degree is not odd.

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Serial Number: **522**, Answers: 1: 2: 3: 4: 5: 6: 7: 8: 9:
Name:

University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: The number of edges of the complete bipartite graph K_{mn}, with vertex sets $A = \{a_1, \ldots, a_m\}$ and $B = \{b_1, \ldots, b_n\}$ is
A: $2(m+n)$ B: $m \cdot n$ C: $m(n-1) + n(m-1)$ D: $m+n$

Question 2: The binomial coefficient $\binom{n}{k}$ equals
A: 0 if $k = 0$. B: $\binom{n}{n-k}$.

Question 3: In a bipartite graph with vertex sets A and B which has a perfect matching of side A
A: each vertex of side A is connected with all vertices of side B. B: the number of vertices of side B is at least the number of vertices of side A. C: each vertex of side B is connected to some vertex in side A. D: the number of vertices of side A is at least the number of vertices of side B.

Question 4: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: $10!$ B: $9!$ C: $11!$ D: 3^{11}

Question 5: A bipartite graph G with vertex sets A and B is r-regular. That is all its vertices have the same degree r. Then
A: For every subset $J \subseteq A$ the set of all its neighbors has more elements than J. B: there is always a perfect matching of the vertices of side A. C: side B has more vertices than side A. D: side A has more vertices than side B.

Question 6: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 2^{10} B: $11!$ C: 10×10 D: $10!$

Question 7: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $10 \cdot 9 \cdot 8 \cdot 7$ B: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$

Question 8: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: 3^n B: $2^n + 2^n$ C: 2^n D: $\binom{n}{n/2}$

Question 9: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: 30 B: 3^{10} C: 10^3 D: $10 \cdot 9 \cdot 8$

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University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: 3^n B: $2^n + 2^n$ C: $\binom{n}{n/2}$ D: 2^n

Question 2: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 10×10 B: 2^{10} C: $11!$ D: $10!$

Question 3: If G is a simple graph then
A: the number of its vertices with odd degree is not odd. B: the number of its vertices with even degree is even. C: it has at least two vertices with odd degree. D: it has at most two vertices with odd degree.

Question 4: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$ B: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$

Question 5: The number of edges of the complete bipartite graph K_{mn}, with vertex sets $A = \{a_1, \ldots, a_m\}$ and $B = \{b_1, \ldots, b_n\}$ is
A: $m \cdot n$ B: $2(m+n)$ C: $m(n-1) + n(m-1)$ D: $m+n$

Question 6: In a simple graph with 100 vertices
A: the minimum vertex degree is ≥ 1. B: not all vertex degrees can be odd. C: the maximum vertex degree is ≤ 99. D: it is possible that all vertices have different degrees.

Question 7: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: 3^{10} B: 30 C: 10^3 D: $10 \cdot 9 \cdot 8$

Question 8: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$ B: $10 \cdot 9 \cdot 8 \cdot 7$

Question 9: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: $\frac{10!}{6!4!}$ B: $6!$ C: 10^4 D: $\frac{10!}{6!}$

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Final examination

Question 1: How many different functions are there from the set $\{1,\ldots,m\}$ to the set $\{1,\ldots,n\}$?
A: $m \cdot n$ B: $n(n-1)\cdots(n-m+1)$ C: n^m D: m^n

Question 2: The binomial coefficient $\binom{n}{k}$ equals
A: $\binom{n}{n-k}$. B: 0 if $k=0$.

Question 3: In how many ways can we choose 4 numbers from the set $\{1,\ldots,10\}$ if the order in which we choose them matters?
A: $\frac{10!}{6!}$ B: 6! C: $\frac{10!}{6!4!}$ D: 10^4

Question 4: How many circular orderings of the numbers $0,1,\ldots,10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 10! B: 3^{11} C: 11! D: 9!

Question 5: The number of edges of the complete bipartite graph K_{mn}, with vertex sets $A=\{a_1,\ldots,a_m\}$ and $B=\{b_1,\ldots,b_n\}$ is
A: $m+n$ B: $m(n-1)+n(m-1)$ C: $2(m+n)$ D: $m \cdot n$

Question 6: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $\binom{8}{4}+\binom{8}{3}+\binom{8}{2}$ B: $10\cdot 9\cdot 8\cdot 7$

Question 7: In a bipartite graph with vertex sets A and B which has a perfect matching of side A
A: each vertex of side A is connected with all vertices of side B. B: the number of vertices of side B is at least the number of vertices of side A. C: each vertex of side B is connected to some vertex in side A. D: the number of vertices of side A is at least the number of vertices of side B.

Question 8: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: 3^{10} B: $10\cdot 9\cdot 8$ C: 30 D: 10^3

Question 9: A bipartite graph G with vertex sets A and B is r-regular. That is all its vertices have the same degree r. Then
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Question 1: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 3^{11} B: $11!$ C: $9!$ D: $10!$

Question 2: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: 30 B: $10 \cdot 9 \cdot 8$ C: 10^3 D: 3^{10}

Question 3: The number of edges of the complete bipartite graph K_{mn}, with vertex sets $A = \{a_1, \ldots, a_m\}$ and $B = \{b_1, \ldots, b_n\}$ is
A: $m + n$ B: $m \cdot n$ C: $2(m + n)$ D: $m(n - 1) + n(m - 1)$

Question 4: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$

Question 5: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $10 \cdot 9 \cdot 8 \cdot 7$ B: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$

Question 6: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: 2^n B: $2^n + 2^n$ C: $\binom{n}{n/2}$ D: 3^n

Question 7: In a bipartite graph with vertex sets A and B which has a perfect matching of side A
A: each vertex of side A is connected with all vertices of side B. B: the number of vertices of side A is at least the number of vertices of side B. C: each vertex of side B is connected to some vertex in side A. D: the number of vertices of side B is at least the number of vertices of side A.

Question 8: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: $6!$ B: 10^4 C: $\frac{10!}{6!}$ D: $\frac{10!}{6!4!}$

Question 9: If G is a connected simple graph with n vertices then
A: it must have at least n edges. B: it cannot contain cycles. C: it must have at least $n - 1$ edges. D: it cannot have more than $n + 1$ edges.

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Final examination

Question 1: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$ B: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$

Question 2: In how many ways can we choose 4 numbers from the set $\{1,\ldots,10\}$ if the order in which we choose them matters?
A: 10^4 B: $\frac{10!}{6!}$ C: $6!$ D: $\frac{10!}{6!4!}$

Question 3: In a bipartite graph with vertex sets A and B which has a perfect matching of side A
A: the number of vertices of side A is at least the number of vertices of side B. B: each vertex of side A is connected with all vertices of side B. C: the number of vertices of side B is at least the number of vertices of side A. D: each vertex of side B is connected to some vertex in side A.

Question 4: How many different functions are there from the set $\{1,\ldots,m\}$ to the set $\{1,\ldots,n\}$?
A: $m\cdot n$ B: m^n C: $n(n-1)\cdots(n-m+1)$ D: n^m

Question 5: If G is a connected simple graph with n vertices then
A: it cannot have more than $n+1$ edges. B: it must have at least $n-1$ edges. C: it cannot contain cycles. D: it must have at least n edges.

Question 6: In a simple graph with 100 vertices
A: the minimum vertex degree is ≥ 1. B: it is possible that all vertices have different degrees. C: not all vertex degrees can be odd. D: the maximum vertex degree is ≤ 99.

Question 7: The binomial coefficient $\binom{n}{k}$ equals
A: 0 if $k=0$. B: $\binom{n}{n-k}$.

Question 8: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: 3^{10} B: 30 C: $10\cdot 9\cdot 8$ D: 10^3

Question 9: In how many ways can the numbers $0,1,\ldots,10$ be put in order?
A: $11!$ B: 2^{10} C: 10×10 D: $10!$

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Final examination

Question 1: If G is a simple graph then
A: the number of its vertices with odd degree is not odd. B: it has at least two vertices with odd degree. C: the number of its vertices with even degree is even. D: it has at most two vertices with odd degree.

Question 2: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$

Question 3: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 9! B: 3^{11} C: 10! D: 11!

Question 4: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: $10 \cdot 9 \cdot 8$ B: 30 C: 3^{10} D: 10^3

Question 5: How many different functions are there from the set $\{1, \ldots, m\}$ to the set $\{1, \ldots, n\}$?
A: n^m B: $m \cdot n$ C: m^n D: $n(n-1)\cdots(n-m+1)$

Question 6: If A is the adjacency matrix of the simple graph G with vertex set $V = \{1, 2, \ldots, n\}$, then the entry $A_{i,j}$, with $i, j \in V$ is
A: equal to 0 exactly when i is not connected to j B: equal to 1 exactly when there is a path that connect i to j. C: equal to the degree of vertex i D: equal to 1 exactly when i is not connected to j

Question 7: A bipartite graph G with vertex sets A and B is r-regular. That is all its vertices have the same degree r. Then
A: side B has more vertices than side A. B: side A has more vertices than side B. C: For every subset $J \subseteq A$ the set of all its neighbors has more elements than J. D: there is always a perfect matching of the vertices of side A.

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Question 9: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: 6! B: $\frac{10!}{6!}$ C: $\frac{10!}{6!4!}$ D: 10^4

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UNIVERSITY OF CRETE – DEPARTMENT OF MATHEMATICS – DISCRETE MATHEMATICS I

Final examination

Question 1: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 3^{11} B: 9! C: 11! D: 10!

Question 2: If A is the adjacency matrix of the simple graph G with vertex set $V = \{1, 2, \ldots, n\}$, then the entry $A_{i,j}$, with $i, j \in V$ is
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Question 3: The binomial coefficient $\binom{n}{k}$ equals
A: 0 if $k = 0$. B: $\binom{n}{n-k}$.

Question 4: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 11! B: 10! C: 2^{10} D: 10×10

Question 5: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
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A: not all vertex degrees can be odd. B: the maximum vertex degree is ≤ 99. C: it is possible that all vertices have different degrees. D: the minimum vertex degree is ≥ 1.

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A: 3^n B: 2^n C: $\binom{n}{n/2}$ D: $2^n + 2^n$

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University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
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A: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$ B: $10 \cdot 9 \cdot 8 \cdot 7$

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Question 6: The number of edges of the complete bipartite graph K_{mn}, with vertex sets $A = \{a_1, \ldots, a_m\}$ and $B = \{b_1, \ldots, b_n\}$ is
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A: $n(n-1)\cdots(n-m+1)$ B: $m \cdot n$ C: n^m D: m^n

Question 9: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: $6!$ B: 10^4 C: $\frac{10!}{6!}$ D: $\frac{10!}{6!4!}$

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University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: The binomial coefficient $\binom{n}{k}$ equals
A: $\binom{n}{n-k}$. B: 0 if $k=0$.

Question 2: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$ B: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$

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A: 3^{20} B: $20\cdot 19\cdot 18$ C: $\frac{20!}{3!}$ D: 20^3

Question 4: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: $10\cdot 9\cdot 8$ B: 3^{10} C: 10^3 D: 30

Question 5: A bipartite graph G with vertex sets A and B is r-regular. That is all its vertices have the same degree r. Then
A: For every subset $J\subseteq A$ the set of all its neighbors has more elements than J. B: side B has more vertices than side A. C: side A has more vertices than side B. D: there is always a perfect matching of the vertices of side A.

Question 6: How many circular orderings of the numbers $0,1,\ldots,10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 10! B: 3^{11} C: 9! D: 11!

Question 7: In how many ways can we choose 4 numbers from the set $\{1,\ldots,10\}$ if the order in which we choose them matters?
A: 10^4 B: $\frac{10!}{6!}$ C: 6! D: $\frac{10!}{6!4!}$

Question 8: In a bipartite graph with vertex sets A and B which has a perfect matching of side A
A: the number of vertices of side A is at least the number of vertices of side B. B: each vertex of side B is connected to some vertex in side A. C: each vertex of side A is connected with all vertices of side B. D: the number of vertices of side B is at least the number of vertices of side A.

Question 9: If G is a simple graph then
A: the number of its vertices with even degree is even. B: it has at most two vertices with odd degree. C: it has at least two vertices with odd degree. D: the number of its vertices with odd degree is not odd.

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Serial Number: **531**, Answers: 1: 2: 3: 4: 5: 6: 7: 8: 9:
Name:

University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: In a bipartite graph with vertex sets A and B which has a perfect matching of side A
A: the number of vertices of side A is at least the number of vertices of side B. B: each vertex of side B is connected to some vertex in side A. C: each vertex of side A is connected with all vertices of side B. D: the number of vertices of side B is at least the number of vertices of side A.

Question 2: How many different functions are there from the set $\{1,\ldots,m\}$ to the set $\{1,\ldots,n\}$?
A: $n(n-1)\cdots(n-m+1)$ B: $m\cdot n$ C: m^n D: n^m

Question 3: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $10\cdot 9\cdot 8\cdot 7$ B: $\binom{8}{4}+\binom{8}{3}+\binom{8}{2}$

Question 4: How many circular orderings of the numbers $0,1,\ldots,10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
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Question 5: A bipartite graph G with vertex sets A and B is r-regular. That is all its vertices have the same degree r. Then
A: side A has more vertices than side B. B: For every subset $J\subseteq A$ the set of all its neighbors has more elements than J. C: there is always a perfect matching of the vertices of side A. D: side B has more vertices than side A.

Question 6: The binomial coefficient $\binom{n}{k}$ equals
A: $\binom{n}{n-k}$. B: 0 if $k=0$.

Question 7: If G is a connected simple graph with n vertices then
A: it must have at least $n-1$ edges. B: it must have at least n edges. C: it cannot contain cycles. D: it cannot have more than $n+1$ edges.

Question 8: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: 3^{10} B: 30 C: $10\cdot 9\cdot 8$ D: 10^3

Question 9: In how many ways can we choose 4 numbers from the set $\{1,\ldots,10\}$ if the order in which we choose them matters?
A: $\frac{10!}{6!}$ B: 10^4 C: $\frac{10!}{6!4!}$ D: $6!$

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University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

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A: 20^3 B: $20 \cdot 19 \cdot 18$ C: 3^{20} D: $\frac{20!}{3!}$

Question 5: If G is a connected simple graph with n vertices then
A: it must have at least $n - 1$ edges. B: it cannot contain cycles. C: it cannot have more than $n + 1$ edges. D: it must have at least n edges.

Question 6: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: 2^n B: $2^n + 2^n$ C: $\binom{n}{n/2}$ D: 3^n

Question 7: If G is a simple graph then
A: the number of its vertices with even degree is even. B: the number of its vertices with odd degree is not odd. C: it has at most two vertices with odd degree. D: it has at least two vertices with odd degree.

Question 8: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 10! B: 11! C: 3^{11} D: 9!

Question 9: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 11! B: 2^{10} C: 10×10 D: 10!

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University of Crete – Department of Mathematics – Discrete Mathematics I

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Question 1: If G is a simple graph then
A: the number of its vertices with even degree is even. B: it has at most two vertices with odd degree. C: it has at least two vertices with odd degree. D: the number of its vertices with odd degree is not odd.

Question 2: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: $6!$ B: $\frac{10!}{6!}$ C: $\frac{10!}{6!4!}$ D: 10^4

Question 3: If G is a connected simple graph with n vertices then
A: it cannot contain cycles. B: it cannot have more than $n+1$ edges. C: it must have at least n edges. D: it must have at least $n-1$ edges.

Question 4: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
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A: $2(m+n)$ B: $m(n-1) + n(m-1)$ C: $m \cdot n$ D: $m + n$

Question 7: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: $2^n + 2^n$ B: 3^n C: 2^n D: $\binom{n}{n/2}$

Question 8: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
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A: 3^n B: 2^n C: $2^n + 2^n$ D: $\binom{n}{n/2}$

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University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
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A: $\frac{10!}{6!4!}$ B: 10^4 C: $\frac{10!}{6!}$ D: $6!$

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Serial Number: **537**, Answers: 1: 2: 3: 4: 5: 6: 7: 8: 9:
Name:

UNIVERSITY OF CRETE – DEPARTMENT OF MATHEMATICS – DISCRETE MATHEMATICS I

Final examination

Question 1: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 9! B: 3^{11} C: 11! D: 10!

Question 2: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$ B: $10 \cdot 9 \cdot 8 \cdot 7$

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Question 6: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: 3^{10} B: $10 \cdot 9 \cdot 8$ C: 30 D: 10^3

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University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

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A: 11! B: 3^{11} C: 10! D: 9!

Question 2: If A is the adjacency matrix of the simple graph G with vertex set $V = \{1, 2, \ldots, n\}$, then the entry $A_{i,j}$, with $i, j \in V$ is
A: equal to 1 exactly when there is a path that connect i to j. B: equal to 0 exactly when i is not connected to j C: equal to 1 exactly when i is not connected to j D: equal to the degree of vertex i

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A: $\binom{n}{n/2}$ B: 3^n C: 2^n D: $2^n + 2^n$

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Question 5: The binomial coefficient $\binom{n}{k}$ equals
A: 0 if $k = 0$. B: $\binom{n}{n-k}$.

Question 6: In a simple graph with 100 vertices
A: the maximum vertex degree is ≤ 99. B: the minimum vertex degree is ≥ 1. C: it is possible that all vertices have different degrees. D: not all vertex degrees can be odd.

Question 7: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: 10^4 B: $\frac{10!}{6!4!}$ C: $6!$ D: $\frac{10!}{6!}$

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Question 5: If A is the adjacency matrix of the simple graph G with vertex set $V = \{1, 2, \ldots, n\}$, then the entry $A_{i,j}$, with $i, j \in V$ is
A: equal to 0 exactly when i is not connected to j B: equal to 1 exactly when i is not connected to j C: equal to the degree of vertex i D: equal to 1 exactly when there is a path that connect i to j.

Question 6: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: 10^3 B: 3^{10} C: 30 D: $10 \cdot 9 \cdot 8$

Question 7: If G is a simple graph then
A: the number of its vertices with odd degree is not odd. B: it has at most two vertices with odd degree. C: the number of its vertices with even degree is even. D: it has at least two vertices with odd degree.

Question 8: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: $11!$ B: 3^{11} C: $9!$ D: $10!$

Question 9: The binomial coefficient $\binom{n}{k}$ equals
A: $\binom{n}{n-k}$. B: 0 if $k = 0$.

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Serial Number: **541**, Answers: 1: 2: 3: 4: 5: 6: 7: 8: 9:
Name:

University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: If A is the adjacency matrix of the simple graph G with vertex set $V = \{1, 2, \ldots, n\}$, then the entry $A_{i,j}$, with $i, j \in V$ is
A: equal to 0 exactly when i is not connected to j B: equal to 1 exactly when i is not connected to j
C: equal to 1 exactly when there is a path that connect i to j. D: equal to the degree of vertex i

Question 2: If G is a connected simple graph with n vertices then
A: it cannot have more than $n+1$ edges. B: it must have at least n edges. C: it cannot contain cycles.
D: it must have at least $n-1$ edges.

Question 3: A bipartite graph G with vertex sets A and B is r-regular. That is all its vertices have the same degree r. Then
A: side A has more vertices than side B. B: For every subset $J \subseteq A$ the set of all its neighbors has more elements than J. C: there is always a perfect matching of the vertices of side A. D: side B has more vertices than side A.

Question 4: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 3^{11} B: 9! C: 10! D: 11!

Question 5: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$ B: $10 \cdot 9 \cdot 8 \cdot 7$

Question 6: The binomial coefficient $\binom{n}{k}$ equals
A: $\binom{n}{n-k}$. B: 0 if $k = 0$.

Question 7: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: $2^n + 2^n$ B: $\binom{n}{n/2}$ C: 3^n D: 2^n

Question 8: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 10×10 B: 11! C: 10! D: 2^{10}

Question 9: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: 30 B: 3^{10} C: $10 \cdot 9 \cdot 8$ D: 10^3

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Serial Number: **542**, Answers: 1: 2: 3: 4: 5: 6: 7: 8: 9:
Name:

UNIVERSITY OF CRETE – DEPARTMENT OF MATHEMATICS – DISCRETE MATHEMATICS I

Final examination

Question 1: In how many ways can we choose 4 numbers from the set $\{1,\ldots,10\}$ if the order in which we choose them matters?
A: 6! B: 10^4 C: $\frac{10!}{6!}$ D: $\frac{10!}{6!4!}$

Question 2: In a simple graph with 100 vertices
A: it is possible that all vertices have different degrees. B: the minimum vertex degree is ≥ 1. C: not all vertex degrees can be odd. D: the maximum vertex degree is ≤ 99.

Question 3: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $10 \cdot 9 \cdot 8 \cdot 7$ B: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$

Question 4: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 11! B: 10! C: 10×10 D: 2^{10}

Question 5: If G is a connected simple graph with n vertices then
A: it cannot contain cycles. B: it must have at least $n-1$ edges. C: it must have at least n edges. D: it cannot have more than $n+1$ edges.

Question 6: How many different functions are there from the set $\{1,\ldots,m\}$ to the set $\{1,\ldots,n\}$?
A: $n(n-1)\cdots(n-m+1)$ B: m^n C: $m \cdot n$ D: n^m

Question 7: If A is the adjacency matrix of the simple graph G with vertex set $V = \{1, 2, \ldots, n\}$, then the entry $A_{i,j}$, with $i, j \in V$ is
A: equal to 1 exactly when there is a path that connect i to j. B: equal to 1 exactly when i is not connected to j C: equal to the degree of vertex i D: equal to 0 exactly when i is not connected to j

Question 8: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$

Question 9: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
A: 20^3 B: $20 \cdot 19 \cdot 18$ C: $\frac{20!}{3!}$ D: 3^{20}

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Name:

University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: The number of edges of the complete bipartite graph K_{mn}, with vertex sets $A = \{a_1, \ldots, a_m\}$ and $B = \{b_1, \ldots, b_n\}$ is
A: $m \cdot n$ B: $m(n-1) + n(m-1)$ C: $m + n$ D: $2(m+n)$

Question 2: How many different functions are there from the set $\{1, \ldots, m\}$ to the set $\{1, \ldots, n\}$?
A: $n(n-1)\cdots(n-m+1)$ B: m^n C: n^m D: $m \cdot n$

Question 3: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: $10!$ B: 2^{10} C: $11!$ D: 10×10

Question 4: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: $\binom{n}{n/2}$ B: 3^n C: $2^n + 2^n$ D: 2^n

Question 5: The binomial coefficient $\binom{n}{k}$ equals
A: 0 if $k = 0$. B: $\binom{n}{n-k}$.

Question 6: If G is a connected simple graph with n vertices then
A: it must have at least $n-1$ edges. B: it must have at least n edges. C: it cannot contain cycles. D: it cannot have more than $n+1$ edges.

Question 7: In a bipartite graph with vertex sets A and B which has a perfect matching of side A
A: each vertex of side A is connected with all vertices of side B. B: the number of vertices of side B is at least the number of vertices of side A. C: each vertex of side B is connected to some vertex in side A. D: the number of vertices of side A is at least the number of vertices of side B.

Question 8: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$

Question 9: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: $6!$ B: $\frac{10!}{6!}$ C: $\frac{10!}{6!4!}$ D: 10^4

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UNIVERSITY OF CRETE – DEPARTMENT OF MATHEMATICS – DISCRETE MATHEMATICS I

Final examination

Question 1: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: 10^4 B: $6!$ C: $\frac{10!}{6!4!}$ D: $\frac{10!}{6!}$

Question 2: In a bipartite graph with vertex sets A and B which has a perfect matching of side A
A: the number of vertices of side B is at least the number of vertices of side A. B: each vertex of side A is connected with all vertices of side B. C: each vertex of side B is connected to some vertex in side A. D: the number of vertices of side A is at least the number of vertices of side B.

Question 3: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$

Question 4: The number of edges of the complete bipartite graph K_{mn}, with vertex sets $A = \{a_1, \ldots, a_m\}$ and $B = \{b_1, \ldots, b_n\}$ is
A: $2(m+n)$ B: $m(n-1)+n(m-1)$ C: $m \cdot n$ D: $m+n$

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A: 3^n B: $2^n + 2^n$ C: 2^n D: $\binom{n}{n/2}$

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Final examination

Question 1: In a bipartite graph with vertex sets A and B which has a perfect matching of side A
A: each vertex of side B is connected to some vertex in side A. B: the number of vertices of side B is at least the number of vertices of side A. C: each vertex of side A is connected with all vertices of side B. D: the number of vertices of side A is at least the number of vertices of side B.

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A: $\binom{n}{n-k}$. B: 0 if $k = 0$.

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A: $10 \cdot 9 \cdot 8 \cdot 7$ B: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$

Question 4: If G is a simple graph then
A: the number of its vertices with even degree is even. B: the number of its vertices with odd degree is not odd. C: it has at most two vertices with odd degree. D: it has at least two vertices with odd degree.

Question 5: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
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Question 6: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
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Question 9: How many different functions are there from the set $\{1, \ldots, m\}$ to the set $\{1, \ldots, n\}$?
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Final examination

Question 1: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: $2^n + 2^n$ B: 2^n C: $\binom{n}{n/2}$ D: 3^n

Question 2: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 3^{11} B: $9!$ C: $10!$ D: $11!$

Question 3: If G is a simple graph then
A: it has at most two vertices with odd degree. B: the number of its vertices with odd degree is not odd. C: it has at least two vertices with odd degree. D: the number of its vertices with even degree is even.

Question 4: If G is a connected simple graph with n vertices then
A: it cannot contain cycles. B: it cannot have more than $n + 1$ edges. C: it must have at least $n - 1$ edges. D: it must have at least n edges.

Question 5: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
A: 3^{20} B: $20 \cdot 19 \cdot 18$ C: 20^3 D: $\frac{20!}{3!}$

Question 6: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: $6!$ B: 10^4 C: $\frac{10!}{6!4!}$ D: $\frac{10!}{6!}$

Question 7: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$

Question 8: In a bipartite graph with vertex sets A and B which has a perfect matching of side A
A: each vertex of side A is connected with all vertices of side B. B: the number of vertices of side B is at least the number of vertices of side A. C: each vertex of side B is connected to some vertex in side A. D: the number of vertices of side A is at least the number of vertices of side B.

Question 9: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$ B: $10 \cdot 9 \cdot 8 \cdot 7$

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Serial Number: **547**, Answers: 1: 2: 3: 4: 5: 6: 7: 8: 9:
Name:

University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: In a simple graph with 100 vertices
A: not all vertex degrees can be odd. B: the minimum vertex degree is ≥ 1. C: it is possible that all vertices have different degrees. D: the maximum vertex degree is ≤ 99.

Question 2: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: 10^3 B: 30 C: 3^{10} D: $10 \cdot 9 \cdot 8$

Question 3: In a bipartite graph with vertex sets A and B which has a perfect matching of side A
A: the number of vertices of side A is at least the number of vertices of side B. B: each vertex of side B is connected to some vertex in side A. C: each vertex of side A is connected with all vertices of side B. D: the number of vertices of side B is at least the number of vertices of side A.

Question 4: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 10! B: 11! C: 3^{11} D: 9!

Question 5: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$ B: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$

Question 6: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
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A: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$ B: $10 \cdot 9 \cdot 8 \cdot 7$

Question 8: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: $\frac{10!}{6!4!}$ B: $\frac{10!}{6!}$ C: 6! D: 10^4

Question 9: If G is a connected simple graph with n vertices then
A: it cannot contain cycles. B: it must have at least $n-1$ edges. C: it must have at least n edges. D: it cannot have more than $n+1$ edges.

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Final examination

Question 1: The number of edges of the complete bipartite graph K_{mn}, with vertex sets $A = \{a_1, \ldots, a_m\}$ and $B = \{b_1, \ldots, b_n\}$ is
A: $m(n-1) + n(m-1)$ B: $m+n$ C: $m \cdot n$ D: $2(m+n)$

Question 2: If A is the adjacency matrix of the simple graph G with vertex set $V = \{1, 2, \ldots, n\}$, then the entry $A_{i,j}$, with $i, j \in V$ is
A: equal to 0 exactly when i is not connected to j B: equal to the degree of vertex i C: equal to 1 exactly when i is not connected to j D: equal to 1 exactly when there is a path that connect i to j.

Question 3: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: 10^3 B: 3^{10} C: $10 \cdot 9 \cdot 8$ D: 30

Question 4: In a bipartite graph with vertex sets A and B which has a perfect matching of side A
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Question 5: How many different functions are there from the set $\{1, \ldots, m\}$ to the set $\{1, \ldots, n\}$?
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A: 3^{11} B: 11! C: 9! D: 10!

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UNIVERSITY OF CRETE – DEPARTMENT OF MATHEMATICS – DISCRETE MATHEMATICS I

Final examination

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A: 11! B: 10! C: 9! D: 3^{11}

Question 2: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
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A: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$ B: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$

Question 4: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: 6! B: 10^4 C: $\frac{10!}{6!}$ D: $\frac{10!}{6!4!}$

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A: the number of vertices of side A is at least the number of vertices of side B. B: each vertex of side B is connected to some vertex in side A. C: each vertex of side A is connected with all vertices of side B. D: the number of vertices of side B is at least the number of vertices of side A.

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UNIVERSITY OF CRETE – DEPARTMENT OF MATHEMATICS – DISCRETE MATHEMATICS I

Final examination

Question 1: How many different functions are there from the set $\{1, \ldots, m\}$ to the set $\{1, \ldots, n\}$?
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A: 10! B: 3^{11} C: 9! D: 11!

Question 3: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: 3^n B: $\binom{n}{n/2}$ C: 2^n D: $2^n + 2^n$

Question 4: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: $\frac{10!}{6!4!}$ B: 10^4 C: 6! D: $\frac{10!}{6!}$

Question 5: In a simple graph with 100 vertices
A: the minimum vertex degree is ≥ 1. B: the maximum vertex degree is ≤ 99. C: not all vertex degrees can be odd. D: it is possible that all vertices have different degrees.

Question 6: A bipartite graph G with vertex sets A and B is r-regular. That is all its vertices have the same degree r. Then
A: there is always a perfect matching of the vertices of side A. B: For every subset $J \subseteq A$ the set of all its neighbors has more elements than J. C: side B has more vertices than side A. D: side A has more vertices than side B.

Question 7: The number of edges of the complete bipartite graph K_{mn}, with vertex sets $A = \{a_1, \ldots, a_m\}$ and $B = \{b_1, \ldots, b_n\}$ is
A: $m \cdot n$ B: $m(n-1) + n(m-1)$ C: $2(m+n)$ D: $m+n$

Question 8: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$

Question 9: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $10 \cdot 9 \cdot 8 \cdot 7$ B: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$

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Question 1: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$ B: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$

Question 2: If G is a connected simple graph with n vertices then
A: it cannot have more than $n+1$ edges. B: it cannot contain cycles. C: it must have at least $n-1$ edges. D: it must have at least n edges.

Question 3: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $\binom{8}{4}+\binom{8}{3}+\binom{8}{2}$ B: $10\cdot 9\cdot 8\cdot 7$

Question 4: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 10×10 B: 2^{10} C: 10! D: 11!

Question 5: The number of edges of the complete bipartite graph K_{mn}, with vertex sets $A=\{a_1,\ldots,a_m\}$ and $B=\{b_1,\ldots,b_n\}$ is
A: $m+n$ B: $m(n-1)+n(m-1)$ C: $m\cdot n$ D: $2(m+n)$

Question 6: In how many ways can we choose 4 numbers from the set $\{1,\ldots,10\}$ if the order in which we choose them matters?
A: $\frac{10!}{6!4!}$ B: $\frac{10!}{6!}$ C: 6! D: 10^4

Question 7: In how many ways can we select two disjoint subsets A and B of $\{1,2,\ldots,n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: 3^n B: $\binom{n}{n/2}$ C: 2^n D: 2^n+2^n

Question 8: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
A: 20^3 B: $\frac{20!}{3!}$ C: 3^{20} D: $20\cdot 19\cdot 18$

Question 9: If G is a simple graph then
A: it has at least two vertices with odd degree. B: it has at most two vertices with odd degree. C: the number of its vertices with odd degree is not odd. D: the number of its vertices with even degree is even.

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Final examination

Question 1: If G is a connected simple graph with n vertices then
A: it must have at least $n-1$ edges. B: it must have at least n edges. C: it cannot contain cycles. D: it cannot have more than $n+1$ edges.

Question 2: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 2^{10} B: $10!$ C: 10×10 D: $11!$

Question 3: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: $10 \cdot 9 \cdot 8$ B: 10^3 C: 3^{10} D: 30

Question 4: If A is the adjacency matrix of the simple graph G with vertex set $V = \{1, 2, \ldots, n\}$, then the entry $A_{i,j}$, with $i, j \in V$ is
A: equal to 1 exactly when i is not connected to j B: equal to the degree of vertex i C: equal to 0 exactly when i is not connected to j D: equal to 1 exactly when there is a path that connect i to j.

Question 5: In a bipartite graph with vertex sets A and B which has a perfect matching of side A
A: each vertex of side B is connected to some vertex in side A. B: the number of vertices of side B is at least the number of vertices of side A. C: each vertex of side A is connected with all vertices of side B. D: the number of vertices of side A is at least the number of vertices of side B.

Question 6: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: $9!$ B: 3^{11} C: $11!$ D: $10!$

Question 7: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: 3^n B: 2^n C: $2^n + 2^n$ D: $\binom{n}{n/2}$

Question 8: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots2\cdot1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots2\cdot1}$

Question 9: The binomial coefficient $\binom{n}{k}$ equals
A: $\binom{n}{n-k}$. B: 0 if $k = 0$.

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Question 1: If A is the adjacency matrix of the simple graph G with vertex set $V = \{1, 2, \ldots, n\}$, then the entry $A_{i,j}$, with $i, j \in V$ is
A: equal to 0 exactly when i is not connected to j B: equal to 1 exactly when i is not connected to j
C: equal to 1 exactly when there is a path that connect i to j. D: equal to the degree of vertex i

Question 2: The binomial coefficient $\binom{n}{k}$ equals
A: 0 if $k = 0$. B: $\binom{n}{n-k}$.

Question 3: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
A: $\frac{20!}{3!}$ B: 3^{20} C: $20 \cdot 19 \cdot 18$ D: 20^3

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A: it must have at least n edges. B: it cannot contain cycles. C: it cannot have more than $n+1$ edges.
D: it must have at least $n-1$ edges.

Question 5: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 10! B: 9! C: 11! D: 3^{11}

Question 6: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: 6! B: 10^4 C: $\frac{10!}{6!4!}$ D: $\frac{10!}{6!}$

Question 7: If G is a simple graph then
A: it has at least two vertices with odd degree. B: the number of its vertices with odd degree is not odd.
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A: 3^{10} B: 10^3 C: $10 \cdot 9 \cdot 8$ D: 30

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A: equal to the degree of vertex i B: equal to 0 exactly when i is not connected to j C: equal to 1 exactly when there is a path that connect i to j. D: equal to 1 exactly when i is not connected to j

Question 2: The binomial coefficient $\binom{n}{k}$ equals
A: 0 if $k = 0$. B: $\binom{n}{n-k}$.

Question 3: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$

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A: For every subset $J \subseteq A$ the set of all its neighbors has more elements than J. B: there is always a perfect matching of the vertices of side A. C: side B has more vertices than side A. D: side A has more vertices than side B.

Question 5: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 10! B: 10×10 C: 11! D: 2^{10}

Question 6: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: $10 \cdot 9 \cdot 8$ B: 10^3 C: 3^{10} D: 30

Question 7: How many different functions are there from the set $\{1, \ldots, m\}$ to the set $\{1, \ldots, n\}$?
A: $m \cdot n$ B: $n(n-1)\cdots(n-m+1)$ C: n^m D: m^n

Question 8: If G is a connected simple graph with n vertices then
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Question 9: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: 6! B: 10^4 C: $\frac{10!}{6!}$ D: $\frac{10!}{6!4!}$

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Question 1: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$

Question 2: In a simple graph with 100 vertices
A: the maximum vertex degree is ≤ 99. B: it is possible that all vertices have different degrees. C: not all vertex degrees can be odd. D: the minimum vertex degree is ≥ 1.

Question 3: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
A: $\frac{20!}{3!}$ B: $20 \cdot 19 \cdot 18$ C: 20^3 D: 3^{20}

Question 4: The number of edges of the complete bipartite graph K_{mn}, with vertex sets $A = \{a_1, \ldots, a_m\}$ and $B = \{b_1, \ldots, b_n\}$ is
A: $m \cdot n$ B: $m(n-1) + n(m-1)$ C: $m+n$ D: $2(m+n)$

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Question 6: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: $\binom{n}{n/2}$ B: 2^n C: $2^n + 2^n$ D: 3^n

Question 7: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$ B: $10 \cdot 9 \cdot 8 \cdot 7$

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A: 10×10 B: $10!$ C: $11!$ D: 2^{10}

Question 9: If G is a connected simple graph with n vertices then
A: it must have at least n edges. B: it must have at least $n-1$ edges. C: it cannot have more than $n+1$ edges. D: it cannot contain cycles.

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Final examination

Question 1: The binomial coefficient $\binom{n}{k}$ equals
A: 0 if $k = 0$. B: $\binom{n}{n-k}$.

Question 2: If A is the adjacency matrix of the simple graph G with vertex set $V = \{1, 2, \ldots, n\}$, then the entry $A_{i,j}$, with $i, j \in V$ is
A: equal to 0 exactly when i is not connected to j B: equal to the degree of vertex i C: equal to 1 exactly when i is not connected to j D: equal to 1 exactly when there is a path that connect i to j.

Question 3: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: $\binom{n}{n/2}$ B: $2^n + 2^n$ C: 3^n D: 2^n

Question 4: If G is a simple graph then
A: it has at most two vertices with odd degree. B: the number of its vertices with even degree is even. C: it has at least two vertices with odd degree. D: the number of its vertices with odd degree is not odd.

Question 5: In a simple graph with 100 vertices
A: the minimum vertex degree is ≥ 1. B: it is possible that all vertices have different degrees. C: the maximum vertex degree is ≤ 99. D: not all vertex degrees can be odd.

Question 6: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: $6!$ B: 10^4 C: $\frac{10!}{6!}$ D: $\frac{10!}{6!4!}$

Question 7: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
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A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots2\cdot1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots2\cdot1}$

Question 9: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
A: 20^3 B: 3^{20} C: $20 \cdot 19 \cdot 18$ D: $\frac{20!}{3!}$

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Question 1: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 3^{11} B: $9!$ C: $10!$ D: $11!$

Question 2: If G is a simple graph then
A: it has at least two vertices with odd degree. B: the number of its vertices with odd degree is not odd.
C: the number of its vertices with even degree is even. D: it has at most two vertices with odd degree.

Question 3: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $10 \cdot 9 \cdot 8 \cdot 7$ B: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$

Question 4: In a bipartite graph with vertex sets A and B which has a perfect matching of side A
A: each vertex of side A is connected with all vertices of side B. B: the number of vertices of side A is at least the number of vertices of side B. C: each vertex of side B is connected to some vertex in side A.
D: the number of vertices of side B is at least the number of vertices of side A.

Question 5: How many different functions are there from the set $\{1, \ldots, m\}$ to the set $\{1, \ldots, n\}$?
A: m^n B: $m \cdot n$ C: $n(n-1)\cdots(n-m+1)$ D: n^m

Question 6: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
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Question 1: The number of edges of the complete bipartite graph K_{mn}, with vertex sets $A = \{a_1, \ldots, a_m\}$ and $B = \{b_1, \ldots, b_n\}$ is
A: $m(n-1)+n(m-1)$ B: $m+n$ C: $m \cdot n$ D: $2(m+n)$

Question 2: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 2^{10} B: $10!$ C: 10×10 D: $11!$

Question 3: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: 30 B: 3^{10} C: 10^3 D: $10 \cdot 9 \cdot 8$

Question 4: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $10 \cdot 9 \cdot 8 \cdot 7$ B: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$

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A: each vertex of side A is connected with all vertices of side B. B: the number of vertices of side B is at least the number of vertices of side A. C: each vertex of side B is connected to some vertex in side A. D: the number of vertices of side A is at least the number of vertices of side B.

Question 6: If G is a connected simple graph with n vertices then
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Question 1: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
A: 3^{20} *B*: $20 \cdot 19 \cdot 18$ *C*: 20^3 *D*: $\frac{20!}{3!}$

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Question 7: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 3^{11} *B*: $10!$ *C*: $11!$ *D*: $9!$

Question 8: The number of edges of the complete bipartite graph K_{mn}, with vertex sets $A = \{a_1, \ldots, a_m\}$ and $B = \{b_1, \ldots, b_n\}$ is
A: $m(n-1) + n(m-1)$ *B*: $m + n$ *C*: $m \cdot n$ *D*: $2(m + n)$

Question 9: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: 2^n *B*: $\binom{n}{n/2}$ *C*: 3^n *D*: $2^n + 2^n$

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Final examination

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A: 3^{20} B: 20^3 C: $\frac{20!}{3!}$ D: $20 \cdot 19 \cdot 18$

Question 3: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $\binom{8}{4}+\binom{8}{3}+\binom{8}{2}$ B: $10 \cdot 9 \cdot 8 \cdot 7$

Question 4: If G is a connected simple graph with n vertices then
A: it cannot have more than $n+1$ edges. B: it must have at least $n-1$ edges. C: it must have at least n edges. D: it cannot contain cycles.

Question 5: In a simple graph with 100 vertices
A: the minimum vertex degree is ≥ 1. B: not all vertex degrees can be odd. C: it is possible that all vertices have different degrees. D: the maximum vertex degree is ≤ 99.

Question 6: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: 3^{10} B: 30 C: 10^3 D: $10 \cdot 9 \cdot 8$

Question 7: In a bipartite graph with vertex sets A and B which has a perfect matching of side A
A: each vertex of side B is connected to some vertex in side A. B: each vertex of side A is connected with all vertices of side B. C: the number of vertices of side A is at least the number of vertices of side B. D: the number of vertices of side B is at least the number of vertices of side A.

Question 8: How many circular orderings of the numbers $0,1,\ldots,10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 9! B: 11! C: 10! D: 3^{11}

Question 9: The binomial coefficient $\binom{n}{k}$ equals
A: $\binom{n}{n-k}$. B: 0 if $k=0$.

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Name:

University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: In a simple graph with 100 vertices
A: the minimum vertex degree is ≥ 1. *B*: the maximum vertex degree is ≤ 99. *C*: it is possible that all vertices have different degrees. *D*: not all vertex degrees can be odd.

Question 2: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: 2^n *B*: $2^n + 2^n$ *C*: $\binom{n}{n/2}$ *D*: 3^n

Question 3: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$ *B*: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$

Question 4: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$ *B*: $10 \cdot 9 \cdot 8 \cdot 7$

Question 5: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 10×10 *B*: 2^{10} *C*: 11! *D*: 10!

Question 6: A bipartite graph G with vertex sets A and B is r-regular. That is all its vertices have the same degree r. Then
A: side B has more vertices than side A. *B*: there is always a perfect matching of the vertices of side A. *C*: For every subset $J \subseteq A$ the set of all its neighbors has more elements than J. *D*: side A has more vertices than side B.

Question 7: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: 10^3 *B*: 30 *C*: 3^{10} *D*: $10 \cdot 9 \cdot 8$

Question 8: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: 6! *B*: $\frac{10!}{6!4!}$ *C*: 10^4 *D*: $\frac{10!}{6!}$

Question 9: If G is a connected simple graph with n vertices then
A: it cannot contain cycles. *B*: it must have at least $n-1$ edges. *C*: it must have at least n edges. *D*: it cannot have more than $n+1$ edges.

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Final examination

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A: 30 B: $10 \cdot 9 \cdot 8$ C: 10^3 D: 3^{10}

Question 3: If A is the adjacency matrix of the simple graph G with vertex set $V = \{1, 2, \ldots, n\}$, then the entry $A_{i,j}$, with $i, j \in V$ is
A: equal to the degree of vertex i B: equal to 0 exactly when i is not connected to j C: equal to 1 exactly when there is a path that connect i to j. D: equal to 1 exactly when i is not connected to j

Question 4: How many different functions are there from the set $\{1, \ldots, m\}$ to the set $\{1, \ldots, n\}$?
A: $m \cdot n$ B: m^n C: n^m D: $n(n-1)\cdots(n-m+1)$

Question 5: If G is a simple graph then
A: the number of its vertices with even degree is even. B: it has at least two vertices with odd degree. C: it has at most two vertices with odd degree. D: the number of its vertices with odd degree is not odd.

Question 6: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 10×10 B: 11! C: 10! D: 2^{10}

Question 7: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$

Question 8: In a simple graph with 100 vertices
A: not all vertex degrees can be odd. B: it is possible that all vertices have different degrees. C: the maximum vertex degree is ≤ 99. D: the minimum vertex degree is ≥ 1.

Question 9: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: 6! B: 10^4 C: $\frac{10!}{6!}$ D: $\frac{10!}{6!4!}$

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Final examination

Question 1: In a bipartite graph with vertex sets A and B which has a perfect matching of side A
A: the number of vertices of side B is at least the number of vertices of side A. B: the number of vertices of side A is at least the number of vertices of side B. C: each vertex of side B is connected to some vertex in side A. D: each vertex of side A is connected with all vertices of side B.

Question 2: The number of edges of the complete bipartite graph K_{mn}, with vertex sets $A = \{a_1, \ldots, a_m\}$ and $B = \{b_1, \ldots, b_n\}$ is
A: $2(m+n)$ B: $m(n-1)+n(m-1)$ C: $m \cdot n$ D: $m+n$

Question 3: How many different functions are there from the set $\{1, \ldots, m\}$ to the set $\{1, \ldots, n\}$?
A: $m \cdot n$ B: m^n C: n^m D: $n(n-1)\cdots(n-m+1)$

Question 4: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$ B: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$

Question 5: If G is a connected simple graph with n vertices then
A: it cannot contain cycles. B: it cannot have more than $n+1$ edges. C: it must have at least n edges. D: it must have at least $n-1$ edges.

Question 6: The binomial coefficient $\binom{n}{k}$ equals
A: 0 if $k=0$. B: $\binom{n}{n-k}$.

Question 7: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: $\frac{10!}{6!4!}$ B: $\frac{10!}{6!}$ C: 10^4 D: $6!$

Question 8: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: $10!$ B: 3^{11} C: $9!$ D: $11!$

Question 9: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
A: 20^3 B: $20 \cdot 19 \cdot 18$ C: 3^{20} D: $\frac{20!}{3!}$

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A: 11! B: 9! C: 3^{11} D: 10!

Question 2: How many different functions are there from the set $\{1, \ldots, m\}$ to the set $\{1, \ldots, n\}$?
A: $n(n-1)\cdots(n-m+1)$ B: m^n C: $m \cdot n$ D: n^m

Question 3: If G is a connected simple graph with n vertices then
A: it cannot have more than $n+1$ edges. B: it must have at least $n-1$ edges. C: it cannot contain cycles. D: it must have at least n edges.

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A: the number of vertices of side B is at least the number of vertices of side A. B: the number of vertices of side A is at least the number of vertices of side B. C: each vertex of side B is connected to some vertex in side A. D: each vertex of side A is connected with all vertices of side B.

Question 5: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$ B: $10 \cdot 9 \cdot 8 \cdot 7$

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Question 7: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 2^{10} B: 10! C: 11! D: 10×10

Question 8: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$

Question 9: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: $\binom{n}{n/2}$ B: 3^n C: $2^n + 2^n$ D: 2^n

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Final examination

Question 1: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: $10 \cdot 9 \cdot 8$ B: 10^3 C: 3^{10} D: 30

Question 2: If G is a simple graph then
A: it has at least two vertices with odd degree. B: the number of its vertices with even degree is even. C: it has at most two vertices with odd degree. D: the number of its vertices with odd degree is not odd.

Question 3: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 3^{11} B: 9! C: 10! D: 11!

Question 4: A bipartite graph G with vertex sets A and B is r-regular. That is all its vertices have the same degree r. Then
A: side B has more vertices than side A. B: there is always a perfect matching of the vertices of side A. C: For every subset $J \subseteq A$ the set of all its neighbors has more elements than J. D: side A has more vertices than side B.

Question 5: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: 10^4 B: 6! C: $\frac{10!}{6!4!}$ D: $\frac{10!}{6!}$

Question 6: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: $2^n + 2^n$ B: 2^n C: 3^n D: $\binom{n}{n/2}$

Question 7: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $10 \cdot 9 \cdot 8 \cdot 7$ B: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$

Question 8: The binomial coefficient $\binom{n}{k}$ equals
A: $\binom{n}{n-k}$. B: 0 if $k = 0$.

Question 9: If G is a connected simple graph with n vertices then
A: it cannot have more than $n + 1$ edges. B: it must have at least n edges. C: it must have at least $n - 1$ edges. D: it cannot contain cycles.

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Final examination

Question 1: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
A: 20^3 B: 3^{20} C: $20 \cdot 19 \cdot 18$ D: $\frac{20!}{3!}$

Question 2: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: $9!$ B: $11!$ C: $10!$ D: 3^{11}

Question 3: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: $10!$ B: 10×10 C: 2^{10} D: $11!$

Question 4: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: 2^n B: 3^n C: $2^n + 2^n$ D: $\binom{n}{n/2}$

Question 5: The number of edges of the complete bipartite graph K_{mn}, with vertex sets $A = \{a_1, \ldots, a_m\}$ and $B = \{b_1, \ldots, b_n\}$ is
A: $m \cdot n$ B: $m + n$ C: $2(m + n)$ D: $m(n - 1) + n(m - 1)$

Question 6: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$ B: $10 \cdot 9 \cdot 8 \cdot 7$

Question 7: The binomial coefficient $\binom{n}{k}$ equals
A: 0 if $k = 0$. B: $\binom{n}{n-k}$.

Question 8: In a bipartite graph with vertex sets A and B which has a perfect matching of side A
A: the number of vertices of side A is at least the number of vertices of side B. B: each vertex of side A is connected with all vertices of side B. C: the number of vertices of side B is at least the number of vertices of side A. D: each vertex of side B is connected to some vertex in side A.

Question 9: If G is a connected simple graph with n vertices then
A: it cannot contain cycles. B: it cannot have more than $n+1$ edges. C: it must have at least n edges. D: it must have at least $n - 1$ edges.

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A: $\binom{n}{n-k}$. *B*: 0 if $k = 0$.

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A: m^n *B*: $m \cdot n$ *C*: $n(n-1)\cdots(n-m+1)$ *D*: n^m

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Question 4: The number of edges of the complete bipartite graph K_{mn}, with vertex sets $A = \{a_1, \ldots, a_m\}$ and $B = \{b_1, \ldots, b_n\}$ is
A: $m \cdot n$ *B*: $m + n$ *C*: $m(n-1) + n(m-1)$ *D*: $2(m+n)$

Question 5: If G is a simple graph then
A: it has at most two vertices with odd degree. *B*: the number of its vertices with even degree is even. *C*: the number of its vertices with odd degree is not odd. *D*: it has at least two vertices with odd degree.

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Question 7: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: $10 \cdot 9 \cdot 8$ *B*: 30 *C*: 3^{10} *D*: 10^3

Question 8: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 11! *B*: 3^{11} *C*: 10! *D*: 9!

Question 9: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: $\frac{10!}{6!}$ *B*: 10^4 *C*: $\frac{10!}{6!4!}$ *D*: 6!

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UNIVERSITY OF CRETE – DEPARTMENT OF MATHEMATICS – DISCRETE MATHEMATICS I

Final examination

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A: $2(m + n)$ B: $m + n$ C: $m \cdot n$ D: $m(n - 1) + n(m - 1)$

Question 8: If G is a connected simple graph with n vertices then
A: it cannot contain cycles. B: it must have at least n edges. C: it must have at least $n - 1$ edges. D: it cannot have more than $n + 1$ edges.

Question 9: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 2^{10} B: 10! C: 10×10 D: 11!

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Final examination

Question 1: If G is a simple graph then
A: it has at least two vertices with odd degree. B: it has at most two vertices with odd degree. C: the number of its vertices with even degree is even. D: the number of its vertices with odd degree is not odd.

Question 2: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 10×10 B: $10!$ C: 2^{10} D: $11!$

Question 3: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$ B: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$

Question 4: The binomial coefficient $\binom{n}{k}$ equals
A: 0 if $k = 0$. B: $\binom{n}{n-k}$.

Question 5: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
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Question 6: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: 3^n B: $\binom{n}{n/2}$ C: 2^n D: $2^n + 2^n$

Question 7: If A is the adjacency matrix of the simple graph G with vertex set $V = \{1, 2, \ldots, n\}$, then the entry $A_{i,j}$, with $i, j \in V$ is
A: equal to 1 exactly when i is not connected to j B: equal to 1 exactly when there is a path that connect i to j. C: equal to the degree of vertex i D: equal to 0 exactly when i is not connected to j

Question 8: If G is a connected simple graph with n vertices then
A: it cannot contain cycles. B: it must have at least n edges. C: it cannot have more than $n+1$ edges. D: it must have at least $n-1$ edges.

Question 9: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: $6!$ B: $\frac{10!}{6!4!}$ C: 10^4 D: $\frac{10!}{6!}$

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Final examination

Question 1: In how many ways can we choose 4 numbers from the set $\{1,\ldots,10\}$ if the order in which we choose them matters?
A: 10^4 B: $\frac{10!}{6!4!}$ C: $\frac{10!}{6!}$ D: $6!$

Question 2: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: $10!$ B: $11!$ C: 10×10 D: 2^{10}

Question 3: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: $10 \cdot 9 \cdot 8$ B: 10^3 C: 3^{10} D: 30

Question 4: In a simple graph with 100 vertices
A: it is possible that all vertices have different degrees. B: the maximum vertex degree is ≤ 99. C: not all vertex degrees can be odd. D: the minimum vertex degree is ≥ 1.

Question 5: If A is the adjacency matrix of the simple graph G with vertex set $V = \{1, 2, \ldots, n\}$, then the entry $A_{i,j}$, with $i, j \in V$ is
A: equal to 1 exactly when i is not connected to j B: equal to 0 exactly when i is not connected to j
C: equal to 1 exactly when there is a path that connect i to j. D: equal to the degree of vertex i

Question 6: If G is a connected simple graph with n vertices then
A: it must have at least n edges. B: it cannot contain cycles. C: it must have at least $n-1$ edges.
D: it cannot have more than $n+1$ edges.

Question 7: The binomial coefficient $\binom{n}{k}$ equals
A: $\binom{n}{n-k}$. B: 0 if $k = 0$.

Question 8: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$

Question 9: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
A: 3^{20} B: $20 \cdot 19 \cdot 18$ C: $\frac{20!}{3!}$ D: 20^3

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Serial Number: **571**, Answers: 1: 2: 3: 4: 5: 6: 7: 8: 9:
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UNIVERSITY OF CRETE – DEPARTMENT OF MATHEMATICS – DISCRETE MATHEMATICS I

Final examination

Question 1: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $\binom{8}{4}+\binom{8}{3}+\binom{8}{2}$ B: $10\cdot 9\cdot 8\cdot 7$

Question 2: If G is a connected simple graph with n vertices then
A: it must have at least $n-1$ edges. B: it must have at least n edges. C: it cannot contain cycles. D: it cannot have more than $n+1$ edges.

Question 3: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 10! B: 10×10 C: 2^{10} D: 11!

Question 4: If G is a simple graph then
A: it has at most two vertices with odd degree. B: the number of its vertices with even degree is even. C: it has at least two vertices with odd degree. D: the number of its vertices with odd degree is not odd.

Question 5: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: 2^n B: 3^n C: 2^n+2^n D: $\binom{n}{n/2}$

Question 6: The binomial coefficient $\binom{n}{k}$ equals
A: 0 if $k=0$. B: $\binom{n}{n-k}$.

Question 7: How many different functions are there from the set $\{1, \ldots, m\}$ to the set $\{1, \ldots, n\}$?
A: m^n B: $m\cdot n$ C: n^m D: $n(n-1)\cdots(n-m+1)$

Question 8: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: $\frac{10!}{6!}$ B: $\frac{10!}{6!4!}$ C: 10^4 D: 6!

Question 9: A bipartite graph G with vertex sets A and B is r-regular. That is all its vertices have the same degree r. Then
A: there is always a perfect matching of the vertices of side A. B: For every subset $J\subseteq A$ the set of all its neighbors has more elements than J. C: side A has more vertices than side B. D: side B has more vertices than side A.

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Serial Number: **572**, Answers: 1: 2: 3: 4: 5: 6: 7: 8: 9:
Name:

University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: 3^n B: $2^n + 2^n$ C: $\binom{n}{n/2}$ D: 2^n

Question 2: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 3^{11} B: 10! C: 11! D: 9!

Question 3: The number of edges of the complete bipartite graph K_{mn}, with vertex sets $A = \{a_1, \ldots, a_m\}$ and $B = \{b_1, \ldots, b_n\}$ is
A: $m(n-1) + n(m-1)$ B: $m \cdot n$ C: $2(m+n)$ D: $m+n$

Question 4: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 2^{10} B: 10×10 C: 11! D: 10!

Question 5: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $10 \cdot 9 \cdot 8 \cdot 7$ B: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$

Question 6: In a simple graph with 100 vertices
A: the minimum vertex degree is ≥ 1. B: the maximum vertex degree is ≤ 99. C: it is possible that all vertices have different degrees. D: not all vertex degrees can be odd.

Question 7: How many different functions are there from the set $\{1, \ldots, m\}$ to the set $\{1, \ldots, n\}$?
A: n^m B: m^n C: $n(n-1)\cdots(n-m+1)$ D: $m \cdot n$

Question 8: The binomial coefficient $\binom{n}{k}$ equals
A: $\binom{n}{n-k}$. B: 0 if $k = 0$.

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University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

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Question 2: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: 3^n B: 2^n C: $\binom{n}{n/2}$ D: $2^n + 2^n$

Question 3: In a simple graph with 100 vertices
A: it is possible that all vertices have different degrees. B: the minimum vertex degree is ≥ 1. C: not all vertex degrees can be odd. D: the maximum vertex degree is ≤ 99.

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A: 0 if $k = 0$. B: $\binom{n}{n-k}$.

Question 5: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 11! B: 10×10 C: 2^{10} D: 10!

Question 6: If G is a simple graph then
A: the number of its vertices with even degree is even. B: the number of its vertices with odd degree is not odd. C: it has at least two vertices with odd degree. D: it has at most two vertices with odd degree.

Question 7: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots2\cdot1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots2\cdot1}$

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A: $m \cdot n$ B: $2(m+n)$ C: $m+n$ D: $m(n-1) + n(m-1)$

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University of Crete – Department of Mathematics – Discrete Mathematics I

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Question 2: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 2^{10} B: $11!$ C: 10×10 D: $10!$

Question 3: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
A: $\frac{20!}{3!}$ B: $20 \cdot 19 \cdot 18$ C: 3^{20} D: 20^3

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A: 3^n B: $\binom{n}{n/2}$ C: 2^n D: $2^n + 2^n$

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Question 9: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: 10^4 B: $\frac{10!}{6!4!}$ C: $6!$ D: $\frac{10!}{6!}$

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University of Crete – Department of Mathematics – Discrete Mathematics I

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Question 3: The binomial coefficient $\binom{n}{k}$ equals
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Question 6: In a bipartite graph with vertex sets A and B which has a perfect matching of side A
A: the number of vertices of side B is at least the number of vertices of side A. B: each vertex of side B is connected to some vertex in side A. C: each vertex of side A is connected with all vertices of side B. D: the number of vertices of side A is at least the number of vertices of side B.

Question 7: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: 10^4 B: $6!$ C: $\frac{10!}{6!}$ D: $\frac{10!}{6!4!}$

Question 8: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 10×10 B: 2^{10} C: $11!$ D: $10!$

Question 9: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: 3^{10} B: $10 \cdot 9 \cdot 8$ C: 30 D: 10^3

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Name:

University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
A: $20 \cdot 19 \cdot 18$ B: 20^3 C: $\frac{20!}{3!}$ D: 3^{20}

Question 2: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: 3^{10} B: $10 \cdot 9 \cdot 8$ C: 10^3 D: 30

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Question 9: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 2^{10} B: $10!$ C: $11!$ D: 10×10

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Name:

University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $\binom{8}{4}+\binom{8}{3}+\binom{8}{2}$ B: $10\cdot 9\cdot 8\cdot 7$

Question 2: In a simple graph with 100 vertices
A: the maximum vertex degree is ≤ 99. B: the minimum vertex degree is ≥ 1. C: not all vertex degrees can be odd. D: it is possible that all vertices have different degrees.

Question 3: The binomial coefficient $\binom{n}{k}$ equals
A: $\binom{n}{n-k}$. B: 0 if $k=0$.

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A: m^n B: $m\cdot n$ C: $n(n-1)\cdots(n-m+1)$ D: n^m

Question 5: How many circular orderings of the numbers $0,1,\ldots,10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 9! B: 10! C: 11! D: 3^{11}

Question 6: In a bipartite graph with vertex sets A and B which has a perfect matching of side A
A: the number of vertices of side A is at least the number of vertices of side B. B: the number of vertices of side B is at least the number of vertices of side A. C: each vertex of side B is connected to some vertex in side A. D: each vertex of side A is connected with all vertices of side B.

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A: 2^{10} B: 10! C: 10×10 D: 11!

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Name:

UNIVERSITY OF CRETE – DEPARTMENT OF MATHEMATICS – DISCRETE MATHEMATICS I

Final examination

Question 1: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: 6! B: $\frac{10!}{6!}$ C: $\frac{10!}{6!4!}$ D: 10^4

Question 2: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
A: $\frac{20!}{3!}$ B: $20 \cdot 19 \cdot 18$ C: 20^3 D: 3^{20}

Question 3: If G is a connected simple graph with n vertices then
A: it must have at least $n-1$ edges. B: it cannot have more than $n+1$ edges. C: it cannot contain cycles. D: it must have at least n edges.

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Question 5: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: 30 B: 3^{10} C: $10 \cdot 9 \cdot 8$ D: 10^3

Question 6: In a simple graph with 100 vertices
A: the minimum vertex degree is ≥ 1. B: not all vertex degrees can be odd. C: the maximum vertex degree is ≤ 99. D: it is possible that all vertices have different degrees.

Question 7: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
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A: $\frac{k(k-1)\cdots(k-n+1)}{n \cdot (n-1) \cdots 2 \cdot 1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k \cdot (k-1) \cdots 2 \cdot 1}$

Question 9: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 10! B: 10×10 C: 2^{10} D: 11!

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Name:

UNIVERSITY OF CRETE – DEPARTMENT OF MATHEMATICS – DISCRETE MATHEMATICS I

Final examination

Question 1: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: $6!$ B: $\frac{10!}{6!}$ C: 10^4 D: $\frac{10!}{6!4!}$

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A: $11!$ B: $10!$ C: 10×10 D: 2^{10}

Question 7: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: 10^3 B: 30 C: 3^{10} D: $10 \cdot 9 \cdot 8$

Question 8: If G is a connected simple graph with n vertices then
A: it must have at least $n-1$ edges. B: it cannot have more than $n+1$ edges. C: it cannot contain cycles. D: it must have at least n edges.

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Serial Number: **580**, Answers: 1: 2: 3: 4: 5: 6: 7: 8: 9:
Name:

University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: The binomial coefficient $\binom{n}{k}$ equals
A: 0 if $k = 0$. *B*: $\binom{n}{n-k}$.

Question 2: If G is a connected simple graph with n vertices then
A: it cannot contain cycles. *B*: it must have at least $n-1$ edges. *C*: it must have at least n edges. *D*: it cannot have more than $n+1$ edges.

Question 3: A bipartite graph G with vertex sets A and B is r-regular. That is all its vertices have the same degree r. Then
A: side A has more vertices than side B. *B*: For every subset $J \subseteq A$ the set of all its neighbors has more elements than J. *C*: there is always a perfect matching of the vertices of side A. *D*: side B has more vertices than side A.

Question 4: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: $2^n + 2^n$ *B*: $\binom{n}{n/2}$ *C*: 3^n *D*: 2^n

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A: 3^{10} *B*: 10^3 *C*: 30 *D*: $10 \cdot 9 \cdot 8$

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A: $\frac{10!}{6!4!}$ *B*: $\frac{10!}{6!}$ *C*: 10^4 *D*: $6!$

Question 7: In a simple graph with 100 vertices
A: the maximum vertex degree is ≤ 99. *B*: the minimum vertex degree is ≥ 1. *C*: it is possible that all vertices have different degrees. *D*: not all vertex degrees can be odd.

Question 8: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$ *B*: $10 \cdot 9 \cdot 8 \cdot 7$

Question 9: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: $11!$ *B*: 10×10 *C*: 2^{10} *D*: $10!$

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Serial Number: **581**, Answers: 1: 2: 3: 4: 5: 6: 7: 8: 9:
Name:

University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: In a bipartite graph with vertex sets A and B which has a perfect matching of side A
A: each vertex of side A is connected with all vertices of side B. B: the number of vertices of side A is at least the number of vertices of side B. C: the number of vertices of side B is at least the number of vertices of side A. D: each vertex of side B is connected to some vertex in side A.

Question 2: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$

Question 3: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 10! B: 10×10 C: 2^{10} D: 11!

Question 4: A bipartite graph G with vertex sets A and B is r-regular. That is all its vertices have the same degree r. Then
A: there is always a perfect matching of the vertices of side A. B: side B has more vertices than side A. C: For every subset $J \subseteq A$ the set of all its neighbors has more elements than J. D: side A has more vertices than side B.

Question 5: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: 3^{10} B: $10 \cdot 9 \cdot 8$ C: 30 D: 10^3

Question 6: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 3^{11} B: 10! C: 9! D: 11!

Question 7: The binomial coefficient $\binom{n}{k}$ equals
A: $\binom{n}{n-k}$. B: 0 if $k = 0$.

Question 8: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: $\binom{n}{n/2}$ B: 3^n C: 2^n D: $2^n + 2^n$

Question 9: If G is a simple graph then
A: it has at least two vertices with odd degree. B: the number of its vertices with even degree is even. C: it has at most two vertices with odd degree. D: the number of its vertices with odd degree is not odd.

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Serial Number: **582**, Answers: 1: 2: 3: 4: 5: 6: 7: 8: 9:
Name:

University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: In a simple graph with 100 vertices
A: not all vertex degrees can be odd. B: the minimum vertex degree is ≥ 1. C: the maximum vertex degree is ≤ 99. D: it is possible that all vertices have different degrees.

Question 2: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$ B: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$

Question 3: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
A: $20\cdot 19\cdot 18$ B: 3^{20} C: 20^3 D: $\frac{20!}{3!}$

Question 4: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: $10\cdot 9\cdot 8$ B: 30 C: 3^{10} D: 10^3

Question 5: A bipartite graph G with vertex sets A and B is r-regular. That is all its vertices have the same degree r. Then
A: there is always a perfect matching of the vertices of side A. B: side B has more vertices than side A. C: For every subset $J\subseteq A$ the set of all its neighbors has more elements than J. D: side A has more vertices than side B.

Question 6: The binomial coefficient $\binom{n}{k}$ equals
A: $\binom{n}{n-k}$. B: 0 if $k=0$.

Question 7: The number of edges of the complete bipartite graph K_{mn}, with vertex sets $A=\{a_1,\ldots,a_m\}$ and $B=\{b_1,\ldots,b_n\}$ is
A: $2(m+n)$ B: $m\cdot n$ C: $m+n$ D: $m(n-1)+n(m-1)$

Question 8: In how many ways can we choose 4 numbers from the set $\{1,\ldots,10\}$ if the order in which we choose them matters?
A: $\frac{10!}{6!}$ B: $6!$ C: $\frac{10!}{6!4!}$ D: 10^4

Question 9: In how many ways can the numbers $0,1,\ldots,10$ be put in order?
A: 10×10 B: 2^{10} C: $10!$ D: $11!$

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University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: $\frac{10!}{6!4!}$ B: $6!$ C: $\frac{10!}{6!}$ D: 10^4

Question 2: If A is the adjacency matrix of the simple graph G with vertex set $V = \{1, 2, \ldots, n\}$, then the entry $A_{i,j}$, with $i, j \in V$ is
A: equal to 0 exactly when i is not connected to j B: equal to 1 exactly when there is a path that connect i to j. C: equal to 1 exactly when i is not connected to j D: equal to the degree of vertex i

Question 3: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $10 \cdot 9 \cdot 8 \cdot 7$ B: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$

Question 4: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: 2^n B: $\binom{n}{n/2}$ C: 3^n D: $2^n + 2^n$

Question 5: If G is a connected simple graph with n vertices then
A: it must have at least $n - 1$ edges. B: it must have at least n edges. C: it cannot have more than $n + 1$ edges. D: it cannot contain cycles.

Question 6: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$

Question 7: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: 10^3 B: 3^{10} C: 30 D: $10 \cdot 9 \cdot 8$

Question 8: In a simple graph with 100 vertices
A: the minimum vertex degree is ≥ 1. B: not all vertex degrees can be odd. C: it is possible that all vertices have different degrees. D: the maximum vertex degree is ≤ 99.

Question 9: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 2^{10} B: $11!$ C: 10×10 D: $10!$

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University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: In a simple graph with 100 vertices
A: the maximum vertex degree is ≤ 99. B: not all vertex degrees can be odd. C: the minimum vertex degree is ≥ 1. D: it is possible that all vertices have different degrees.

Question 2: If A is the adjacency matrix of the simple graph G with vertex set $V = \{1, 2, \ldots, n\}$, then the entry $A_{i,j}$, with $i, j \in V$ is
A: equal to the degree of vertex i B: equal to 1 exactly when there is a path that connect i to j. C: equal to 1 exactly when i is not connected to j D: equal to 0 exactly when i is not connected to j

Question 3: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
A: $20 \cdot 19 \cdot 18$ B: 3^{20} C: 20^3 D: $\frac{20!}{3!}$

Question 4: In a bipartite graph with vertex sets A and B which has a perfect matching of side A
A: each vertex of side A is connected with all vertices of side B. B: the number of vertices of side B is at least the number of vertices of side A. C: each vertex of side B is connected to some vertex in side A. D: the number of vertices of side A is at least the number of vertices of side B.

Question 5: In how many ways can we select two disjoint subsets A and B of $\{1, 2, \ldots, n\}$? (The internal order in A and B is irrelevant, but it matters which set is A and which is B.)
A: 3^n B: $2^n + 2^n$ C: 2^n D: $\binom{n}{n/2}$

Question 6: How many different quadruples can one form from the objects 1, 1, 2, 3, 4, 5, 6, 7, 8, 9. Two quadruples differing only in order are not considered different.
A: $10 \cdot 9 \cdot 8 \cdot 7$ B: $\binom{8}{4} + \binom{8}{3} + \binom{8}{2}$

Question 7: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: $9!$ B: 3^{11} C: $10!$ D: $11!$

Question 8: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 10×10 B: $10!$ C: $11!$ D: 2^{10}

Question 9: The binomial coefficient $\binom{n}{k}$ equals
A: $\binom{n}{n-k}$. B: 0 if $k = 0$.

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University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: $11!$ B: 10×10 C: $10!$ D: 2^{10}

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A: each vertex of side A is connected with all vertices of side B. B: the number of vertices of side B is at least the number of vertices of side A. C: the number of vertices of side A is at least the number of vertices of side B. D: each vertex of side B is connected to some vertex in side A.

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A: $\frac{10!}{6!}$ B: $6!$ C: $\frac{10!}{6!4!}$ D: 10^4

Question 6: In a simple graph with 100 vertices
A: the maximum vertex degree is ≤ 99. B: not all vertex degrees can be odd. C: it is possible that all vertices have different degrees. D: the minimum vertex degree is ≥ 1.

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Name:

UNIVERSITY OF CRETE – DEPARTMENT OF MATHEMATICS – DISCRETE MATHEMATICS I

Final examination

Question 1: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 9! B: 3^{11} C: 11! D: 10!

Question 2: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: $\frac{10!}{6!}$ B: 6! C: 10^4 D: $\frac{10!}{6!4!}$

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A: $2^n + 2^n$ B: $\binom{n}{n/2}$ C: 3^n D: 2^n

Question 4: In a simple graph with 100 vertices
A: it is possible that all vertices have different degrees. B: the minimum vertex degree is ≥ 1. C: not all vertex degrees can be odd. D: the maximum vertex degree is ≤ 99.

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A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$

Question 6: The binomial coefficient $\binom{n}{k}$ equals
A: 0 if $k = 0$. B: $\binom{n}{n-k}$.

Question 7: If G is a connected simple graph with n vertices then
A: it must have at least n edges. B: it cannot contain cycles. C: it must have at least $n - 1$ edges. D: it cannot have more than $n + 1$ edges.

Question 8: The number of edges of the complete bipartite graph K_{mn}, with vertex sets $A = \{a_1, \ldots, a_m\}$ and $B = \{b_1, \ldots, b_n\}$ is
A: $2(m + n)$ B: $m(n - 1) + n(m - 1)$ C: $m \cdot n$ D: $m + n$

Question 9: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: 10^3 B: 3^{10} C: 30 D: $10 \cdot 9 \cdot 8$

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Instructor: Mihalis Kolountzakis Iraklio, 7 February 2004

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Name:

University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

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A: $m \cdot n$ B: $2(m+n)$ C: $m+n$ D: $m(n-1) + n(m-1)$

Question 9: If G is a simple graph then
A: it has at least two vertices with odd degree. B: the number of its vertices with odd degree is not odd. C: it has at most two vertices with odd degree. D: the number of its vertices with even degree is even.

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Name:

UNIVERSITY OF CRETE – DEPARTMENT OF MATHEMATICS – DISCRETE MATHEMATICS I

Final examination

Question 1: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: $\frac{10!}{6!}$ B: $6!$ C: $\frac{10!}{6!4!}$ D: 10^4

Question 2: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
A: $\frac{20!}{3!}$ B: 3^{20} C: 20^3 D: $20 \cdot 19 \cdot 18$

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Question 5: If G is a connected simple graph with n vertices then
A: it cannot have more than $n+1$ edges. B: it must have at least $n-1$ edges. C: it cannot contain cycles. D: it must have at least n edges.

Question 6: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: $10 \cdot 9 \cdot 8$ B: 30 C: 3^{10} D: 10^3

Question 7: A bipartite graph G with vertex sets A and B is r-regular. That is all its vertices have the same degree r. Then
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Question 8: In a simple graph with 100 vertices
A: not all vertex degrees can be odd. B: the maximum vertex degree is ≤ 99. C: it is possible that all vertices have different degrees. D: the minimum vertex degree is ≥ 1.

Question 9: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: $10!$ B: 2^{10} C: 10×10 D: $11!$

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University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: If we have 10 distinct objects and we can color each of them red, green or blue, how many different colorings are possible?
A: 3^{10} B: 30 C: $10 \cdot 9 \cdot 8$ D: 10^3

Question 2: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: $\frac{10!}{6!}$ B: $6!$ C: $\frac{10!}{6!4!}$ D: 10^4

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A: the number of vertices of side B is at least the number of vertices of side A. B: each vertex of side B is connected to some vertex in side A. C: each vertex of side A is connected with all vertices of side B. D: the number of vertices of side A is at least the number of vertices of side B.

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A: $\binom{n}{n-k}$. B: 0 if $k = 0$.

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A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$

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A: $2^n + 2^n$ B: 2^n C: 3^n D: $\binom{n}{n/2}$

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Serial Number: **590**, Answers: 1: 2: 3: 4: 5: 6: 7: 8: 9:
Name:

University of Crete – Department of Mathematics – Discrete Mathematics I

Final examination

Question 1: In how many ways can the numbers $0, 1, \ldots, 10$ be put in order?
A: 10! B: 11! C: 2^{10} D: 10×10

Question 2: How many circular orderings of the numbers $0, 1, \ldots, 10$ are there? (Two circular orderings which differ only by a rotation are not considered different.)
A: 3^{11} B: 9! C: 10! D: 11!

Question 3: How many different functions are there from the set $\{1, \ldots, m\}$ to the set $\{1, \ldots, n\}$?
A: $m \cdot n$ B: $n(n-1)\cdots(n-m+1)$ C: m^n D: n^m

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UNIVERSITY OF CRETE – DEPARTMENT OF MATHEMATICS – DISCRETE MATHEMATICS I

Final examination

Question 1: In how many ways can we choose 4 numbers from the set $\{1, \ldots, 10\}$ if the order in which we choose them matters?
A: 10^4 B: $\frac{10!}{6!}$ C: $6!$ D: $\frac{10!}{6!4!}$

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A: $\frac{k(k-1)\cdots(k-n+1)}{n\cdot(n-1)\cdots 2\cdot 1}$ B: $\frac{n(n-1)\cdots(n-k+1)}{k\cdot(k-1)\cdots 2\cdot 1}$

Question 4: In how many ways can we select, from a set of 20 people, a committee of 3 different persons with a chair, secretary and member?
A: $\frac{20!}{3!}$ B: 20^3 C: 3^{20} D: $20 \cdot 19 \cdot 18$

Question 5: In a simple graph with 100 vertices
A: the minimum vertex degree is ≥ 1. B: not all vertex degrees can be odd. C: it is possible that all vertices have different degrees. D: the maximum vertex degree is ≤ 99.

Question 6: How many different functions are there from the set $\{1, \ldots, m\}$ to the set $\{1, \ldots, n\}$?
A: m^n B: $m \cdot n$ C: $n(n-1)\cdots(n-m+1)$ D: n^m

Question 7: A bipartite graph G with vertex sets A and B is r-regular. That is all its vertices have the same degree r. Then
A: For every subset $J \subseteq A$ the set of all its neighbors has more elements than J. B: side B has more vertices than side A. C: there is always a perfect matching of the vertices of side A. D: side A has more vertices than side B.

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A: $10\cdot 9\cdot 8\cdot 7$ B: $\binom{8}{4}+\binom{8}{3}+\binom{8}{2}$

Question 7: If G is a simple graph then
A: the number of its vertices with odd degree is not odd. B: it has at least two vertices with odd degree. C: the number of its vertices with even degree is even. D: it has at most two vertices with odd degree.

Question 8: In how many ways can we choose n objects from k different objects, if the order of choice does not matter?
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