PRINTABLE VERSION

Quiz 8

You scored 90 out of 100

Question 1

Your answer is CORRECT.

A clockmaker assigns to each clock produced a serial number consisting of 4 capital letters of the English alphabet followed by 4 numerals (0 through 9). Here is one example of such a serial number:

$$\mathrm{DISC3336}$$

How many different serial numbers are possible if repetition of letters and digits is allowed?

a) $26^4 \cdot 9^4$

b) $26^4 \cdot 9^4$

c) $4 \cdot 4$

d) $26^4 \cdot 10^4$

e) $26^4 \cdot 10^4$

Question 2

Your answer is CORRECT.

Consider making lists from the symbols T, U, V, W, X, Y, Z. How many length-4 lists are possible if repitition is not allowed and the list must contain a W in the first position?

a) $6 \cdot 5 \cdot 4$

b) $7^4 - 6^4 = 1105$

c) $6!$

d) 7^4

e) 4^7

Question 3

Your answer is INCORRECT.

Of the options provided below, which one best completes the sentence "The notation $\frac{n!}{(n-k)!}$ "

a) refers to the number of ways a non-repetitive length-k list may be formed using n symbols

b) refers to the number of non-repetitive length n lists that can be made from n symbols

c) $= |P(S)|$ (where $|S| = n$)

d) $= \dfrac{n!}{k!(n-k)!}$

e) $= \dfrac{n}{(n-k)}$

Question 4

Your answer is CORRECT.

Suppose the set S has 6 elements. How many subsets of size 5 are there?

a) 40

b) 6

c) 720

d) 7776

Question 5

Your answer is CORRECT.

A (numerical) palindrome is a natural number that, when expressed in our standard digit system, reads the same forward as backward. For example, the number 12021 is a palindrome, as is 353. How many 10 digit palindromes are there?

a) $9 \cdot 10^4$

b) 10^{10}

c) $9^2 \cdot 10^8$

d) 10^5

e) $9 \cdot 10^9$

Question 6

Your answer is CORRECT.

This problem concerns lists of length 11 made from the (capital letters from the) English alphabet $A, B, C, \ldots, Y, Z$. How many lists will contain the word MATH?

a) 4^{10}

b) 26^7

c) $8 \cdot 26^7$

d) 26^{10}

e) 7^{26}

Question 7

Your answer is CORRECT.

Of the options provided below, which one best explains why the following formula is true?

$$\binom{n}{0} + \binom{n}{1} + \binom{n}{2} + \cdots + \binom{n}{n-1} + \binom{n}{n} = 2^n$$

a) The sum on the left side adds up numbers from 1 to n. The expression on the right equals the number of *all* possible numbers between 1 and n, and so these two values must be equal.

b) No explanation can be given becuase this equation is not true.

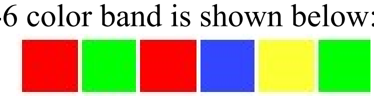
c) Both expressions involve n and subsets.

d) The sum on the left side adds up the different numbers of subsets of an n-element set, starting with the number of size-0 subsets, then the number of size-1 subsets, etc. The expression on the right equals the number of *all* possible subsets, and so these two values must be equal.

Question 8

Your answer is CORRECT.

A length-n "color band" is a sequence of n squares arranged along a single row, where each square has been filled in with a particular color *and* the coloring obeys this one rule: *no two adjacent squares can have the same color.* An example of a length-6 color band is shown below:



How many length-5 color bands are possible when we are only allowed to pick from 6 colors?

a) $6^2 \cdot 5^3$

b) 6^5

c) $\frac{6!}{(6-5)!} = 720$

d) $6 \cdot 5^4$

e) $\frac{5!}{(5-6)!} = 0$

Question 9

Your answer is CORRECT.

How many 13-digit binary strings contain exactly 3 zeroes?

a) 2^{10}

b) $\binom{13}{3} = 286$

c) $\binom{3}{13} = 0$

d) $2^{13} - 2^3 = 8184$

Question 10

Your answer is CORRECT.

Thank you for working hard on this quiz! As a token of your instructor's appreciation, take just a few moments to enjoy answering this question: Which of the following most accurately summarizes the content of this quiz?

a) The derivive of $\sin x$ is $\cos x$.

b) Counting is super easy! We learned about it when I was, like, six years old.

c) Counting strings (and related objects) uses the Multiplication Principle and often involves expressions like $n!$ or $\frac{n!}{(n-k)!} = n \cdot (n-1) \cdot (n-2) \cdots (n-k+1)$. Counting subsets (and related objects) is related to counting strings, but there are fewer subsets than strings since order doesn't matter; counting subsets (and related objects) often uses expressions like $\binom{n}{k} = \dfrac{n!}{n!(n-k)!}$.

d) ○ Counting cards isn't illegal, but it can get you banned from casinos.

e) ○ None of the above.