AMTH 108 Homework
1–8–60

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Question #9

Evaluate each of these expressions:

a) $9! = 9 * 8 * 7 * 6 * 5 * 4 * 3 * 2 * 1 = 362880$

b) $6! = 6 * 5 * 4 * 3 * 2 * 1 = 720$

c) ${}_7P_3 = \frac{7!}{(7-3)!} = 7 * 6 * 5 = 210$

d) ${}_6P_2 = \frac{6!}{(6-2)!} = 6 * 5 = 30$

e) ${}_5P_5 = \frac{5!}{(5-5)!} = 5 * 4 * 3 * 2 = 120$

f) ${}_6P_6 = \frac{6!}{(6-6)!} = 6 * 5 * 4 * 3 * 2 = 720$

Question #11

In setting up a computer system for the home firm to use in quality control, an engineer has four choices for the main unit: IBM, VAX, Honeywell, or HP. There are six brands of CRTs that can be purchased and three types of graphics printers.

a) There are no restrictions on replacement or ordering, so we can assume that we are looking for the total amount of configurations. We have 3 qualities with 4, 6, and 3 "flavors", respectively. Therefore we have $4 * 6 * 3 = 72$ different configurations.

b) Here the restriction is that we decreased our amount of main unit "flavors", so we have $2 * 6 * 3 = 36$ configurations.

Question #13

The Apollo mission to land humans on the moon made use of a system whose basic structure is shown in Fig. 1.5. For the system to operate successfully, all five components shown must function properly. Let us identify each component as being either operable O or inoperable i. Thus the sequence $OOOOi$ denotes a state in which all components except the LEM engine are operable.

a) We have 5 different components which all can be in a "operable" or "inoperable" state. Therefore the total different configurations is $2^5 = 32$.

b) We put a restriction on the LEM engine, so we have $2 * 2 * 2 * 2 * 1 = 16$ configuration.

c) We have a restriction on the first three components now, to only be operable: $1 * 1 * 1 * 2 * 2 = 4$

d) There is only one configuration where all are operable $OOOOO$, so there is 1 configuration.

Question #14

The basic storage unit of a digital computer is a "bit." A bit is a storage position that can be designated as either on (1) or off (0) at any given time. In converting picture images to a form that can transmitted electronically, a picture element, called a *pixel* is used. Each pixel is quantized into gray levels and coded using a binary code. For example, a pixel with four gray levels can be coded using two bits by designating the gray levels by 00, 01, 10, and 11.

a) The amount of gray levels is $2^4 = 16$ configurations.

b) To get up to 32 gray levels is 5-bits ($2^5 = 32$).

Question #15

Tests will be run on five different coatings used to protect fiber optics cables from extreme cold. These tests will be conducted in random order.

a) The total amount of different combinations is $5 * 4 * 3 * 2 * 1 = 120$.

b) The restriction is that two must be together, so we have $2 * 4! = 2 * 4 * 3 * 2 * 1 = 48$. The probability is $\frac{48}{120} = 20\%$

Question #16

The effectiveness of irradiated polymers in the removal of benzene from water is being investigated. Three polymers are to be studied. Each is to be tested at four different temperatures and three different radiation levels.

a) The total experimental conditions under study is $3 * 4 * 3 = 36$.

b) If every single experimental condition is repeated 5 times, it is equal to $5 * \text{total conditions} = 5 * 36 = 180$

Question #29

The configuration of a particular computer terminal consists of a baud-rate setting, a duplex setting, and a parity setting. There are 11 possible baud-rate settings, two parity settings (even or odd), and two duplex settings (half or full).

a) The total amount of different configurations is $11 * 2 * 2 = 44$.

b) If we put a restriction on the parity and duplex settings, the amount of different configurations for this is $11 * 1 * 1 = 11$.

c) We found the amount of configurations that can be even and full. So the probability is $\frac{11}{44} = 25\%$.

Question #33

A mainframe computer has 16 ports. At any given time each port is either in use or not in use. How many possibilities are there for overall port usage of this computer? How many of these entail the use of at least 1 port?

a) Each port has two states, so if we have 16 ports, then there are a total of $2^{16} = 65536$ different configurations.

b) There is only one configuration that doesn't fit within the restrictions, 0000000000000000 (i.e. all off), so there are 65535 different configurations where at least one port is open.