SECI 1013

DISCRETE STRUCTURE

TUTORIAL 2

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1. a.) $6 \times 6 \times 6 = 216$

b.) $6 \times 5 \times 4 = 120$

c.) $2 \times 3 \times 3 = 18$

2. a.) $(6-1)! \times 5! = 14400$

b) $(9-1)! \times 2! = 80640$

c.) $(5-1)! \times 5! = 2880$

d.) $11! \times 2! = 79833600$

3. a.) $5! = 120$

b.) ${}^5C_2 \times 4! = 240$

c.) ${}^5C_2 \times {}^3C_2 \times 3! = 180$

4. a.) $\frac{(12+6-1)!}{12! \times 5!} = 6188$

b.) Select 2 croissant from each kind.

$2 \times 6 = 12$

Two dozen $= 12 \times 2$

$= 24$

$24 - 12 = 12$

Selecting remaining 12 croissants

$\frac{(12+6-1)!}{12! \times 5!} = 6188$

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c.) Select 5 chocolate croissants and 3 almond croissants firstly.

$24 - 5 - 3 = 16$

$\frac{(16+6-1)!}{16! \times 5!} = 20349$

5. a.) Let W = win

T = Tie

Games end with 2 condition : (2W and 1W/T) or (1W and 3W/T)

2W among 4 games $= {}^4C_2$

$= 6$

1W among 3 games $= {}^3C_1$

$= 3$

2W and 1W/T $= 6 \times 3 \times 2$

$= 36$

1W and 3W/T $= 3 \times 6 \times 2^3$

$= 96$

Total $= 2 \times (36 + 96)$

$= 264$

b.) $2^{10} = 1024$

Settled in first round 10 penalty kicks = 264 scenarios

$1024 - 264 = 760$

$760 \times 264 = 200640$

c.) Suden death $= 2+2+2+2+2$

$= 10$

First and second round $= 760 \times 760$

$= 577600$ scenarios

Total scenarios $= 577600 \times 10$

$= 5776000$

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6. 10 questions with 4 choices

$4^{10} = 1048576$

$k+1 = 3$

$k = 2$

$m = kn + 1$

$= 2(1048576) + 1$

$= 2097153$

∴ 2097153 is the minimum number of students that must be in the professor's class in order to guarantee that at least three answer sheets must be identical.

7. Let P(H) = student passed in history

Let P(M) = student passed in Mathematics

$P(H) = 75\%$

$P(M) = 65\%$

$P(H \cap M) = 50\%$

$P(H \cup M) = 75\% + 65\% - 50\%$

$= 90\%$

Fail both subjects $= 100\% - 90\%$

$= 10\%$

$x \times \frac{10}{100} = 35$

$x = 350$

∴ There are total 350 candidates sit for the exam.

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8. Total number integer in the set from 300 to 780 = 780 - 300 + 1
= 481

1 in 3 digits = 0 number
1 in 2 digits = 311, 411, 511, 611, 711
= 5 numbers
1 in 1 digits :
3 _ _ = 301, 310, 312, 313, 314, 315, 316, 317, 318, 319, 321, 331, 341, 351, 361, 371, 381, 391
= 18 numbers
4 _ _ = 401, 410, 412, 413, 414, 415, 416, 417, 418, 419, 421, 431, 441, 451, 461, 471, 481, 491
= 18 numbers
5 _ _ = 501, 510, 512, 513, 514, 515, 516, 517, 518, 519, 521, 531, 541, 551, 561, 571, 581, 591
= 18 numbers
6 _ _ = 601, 610, 612, 613, 614, 615, 616, 617, 618, 619, 621, 631, 641, 651, 661, 671, 681, 691
= 18 numbers
7 _ _ = 701, 710, 712, 713, 714, 715, 716, 717, 718, 719, 721, 731, 741, 751, 761, 771
= 16 numbers

Total = 0 + 5 + 4(18) + 16
= 93

Probability = $\frac{93}{481}$
= 0.1933

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9. a.) ${}^{10}C_6 \times \frac{6!}{4! \times 2!}$

$= 3150$

b.) $\underbrace{\_\ \_\ \_\ \_}\ \_\ \_\ \_\ \_\ \_\ \_$

empty slots

$\frac{6!}{4! \times 2!} \times \frac{4!}{4!} \times 7 = 105$

$\text{Probability} = \frac{105}{3150}$

$= \frac{1}{30}$

10. $P(\text{email}) = 0.4$ $P(\text{receive} \mid \text{email}) = 0.6$

$P(\text{letter}) = 0.1$ $P(\text{receive} \mid \text{letter}) = 0.8$

$P(\text{handphone}) = 0.5$ $P(\text{receive} \mid \text{handphone}) = 1$

a.) $P(\text{receive}) = (0.6 \times 0.4) + (0.8 \times 0.1) \times (1 \times 0.5)$

$= 0.82$

b) $P(\text{email} \mid \text{receive}) = \frac{P(\text{email} \cap \text{receive})}{P(\text{receive})}$

$= \frac{(0.6)(0.4)}{0.82}$

$= 0.2927$

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11. Let C = cars
L = light truck
F = fatal accident
N = not a fatal accident

$P(F|C) = \frac{20}{100000}$

$P(F|L) = \frac{25}{100000}$

$P(L) = 0.4$

$P(C) = 1 - 0.4$
$= 0.6$

$P(L|F) = \frac{P(L \cap F)}{P(F)}$

$= \frac{(0.00025)(0.4)}{(0.00025)(0.4) + (0.0002)(0.6)}$

$= 0.4545$

12. Total of ways $= 4^9$
$= 262144$

Let T = number of ways tetrahedron box have no letters.
C = number of ways cube box have no letters.
P = number of ways polyhedron box have no letters.
D = number of ways dodecahedron box have no letters.

Total ways with at least 1 letter in each box.
$= 4^9 - [T \cup C \cup P \cup D]$
$= 262144 - [{}^4C_1 \times 3^9 - {}^4C_2 \times 2^9 + {}^4C_3 \times 1^9 - {}^4C_4 \times 0^9]$
$= 262144 - (78732 - 3072 + 4 - 0)$
$= 186480$