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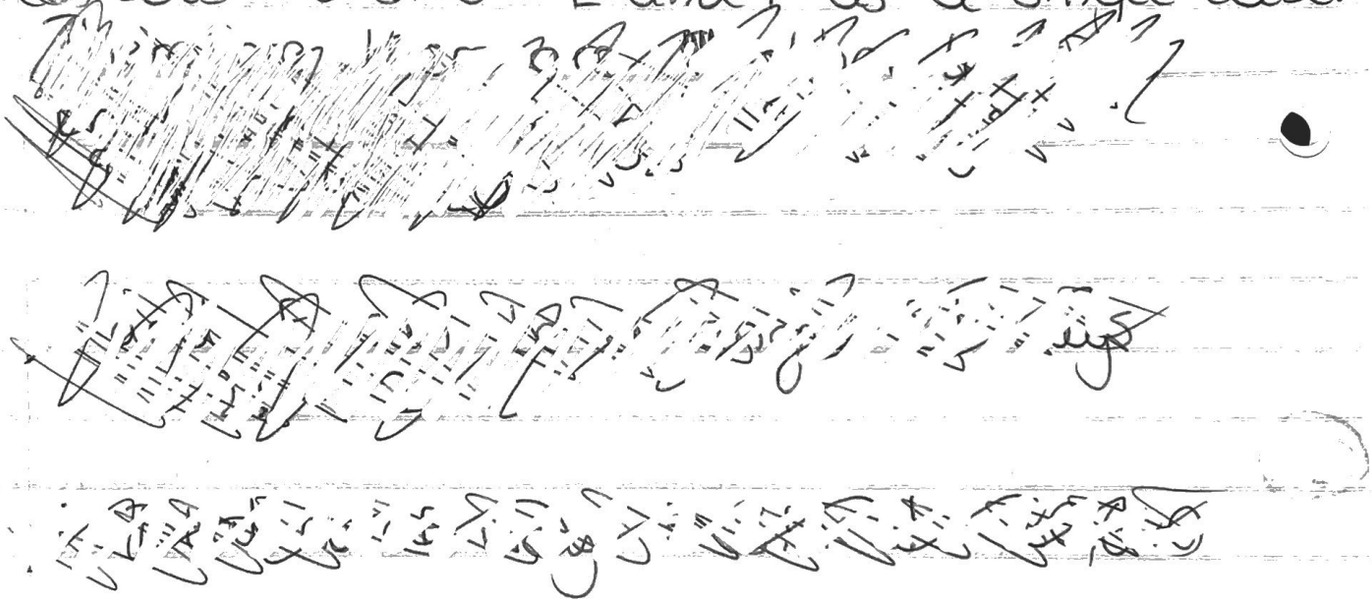
Statistical Methods for CS

Weekly Questions | Week 1

Q1 (a) $10! = 10 \times 9 \times 8 \times \ldots \times 2 \times 1 = \boxed{3,628,800}$ ways.

(b) Lets consider E and F as a single letter.



There are 9 letters in total.

$9! = 362,880$

E and F can be arranged in 2! ways

$2! = 2$

∴ Total no. of way to rearrange

$= 9! \times 2! = \boxed{725,760}$ ways

(c) There are 6 letters in BANANA.
There is 1 B, 3 A's, 2 N's.

Number of possible arrangements is 6!, however we must remove duplicate words.

$$\Rightarrow \frac{6!}{(2! * 3!)} = \boxed{60} \text{ different letter arrangements.}$$

(d) Choose 3 letters from ABCDE

(ie) $\binom{5}{3} = \boxed{10}$

(Q2) (a) The die has 6 possible outcomes each time it is rolled.
Therefore when it is rolled 4 times, the possible number of outcomes is:

$$6 \times 6 \times 6 \times 6 = 6^4 = \boxed{1296} \text{ outcomes}$$

(b) Imagine the rolls ordered from 1 to 4.
We can choose which rolls the 3's will be rolled on as a combination.
Since there are four possible slots and two 3's to place:

$$\binom{4}{2} = 6$$

After choosing the 3's, we have two slots remaining and five possible dice outcomes for each slot.

(As there cannot be anymore 3's)
Final answer:

$$6 * 5^2 = \boxed{150} \text{ possible outcomes}$$

(c) At least two 3's?
I will find the number of outcomes containing no 3's and outcomes containing one 3 and then minus these from the total no. of outcomes -> 1296.

How many contain exactly one 3?
Four possible slots and one 3 to place
=> $\binom{4}{1} = 4$

Three slots remaining and five possible dice outcomes for each slot:

$$4 * 5^3 = 500$$

How many contain no 3's?
Only 5 outcomes on the dice roll will suffice (1,2,4,5,6) and there are 4 rolls:

$5^4 = 625$ outcome with no 3's.

At least two 3's?
$1296 - 500 - 625 = \boxed{171}$ possible outcomes.

(Q3)(a) There are 8 cards, they are all aces with each ace sharing a suit with one other ace. Therefore, there are 2 hearts, 2 spades, 2 clubs and 2 diamonds.

No. of possible arrangements is 8!, however we must remove duplicates.

$$\Rightarrow \frac{8!}{(2! * 2! * 2! * 2!)} = \frac{40,320}{16} = \boxed{2,520} \text{ ways}$$

(b) Heart = H, Diamond = D, Club = C, Spade = S

outcome table

	H	D	C	S
H	HH	HD	HC	HS
D	DH	DD	DC	DS
C	CH	CD	CC	CS
S	SH	SD	SC	SS

Since order does not matter, there are only 6 distinct outcomes that are not 2 of the same suit nor reverse of another outcome.

Answer = $\boxed{6}$ distinct pairs

(c) From the outcome table above, there are 4 "good" pairs: HH, HD, DH, DD
Since order does not matter, HD = DH.
Therefore, there are $\boxed{3}$ ways to get two "good" cards.