

Cambridge International AS & A Level

Mathematics

9709/52

Paper 5 Probability & Statistics 1

May/June 2024

Question No (7)

<https://kingcambridgesolutions.com>

Question No (7)

- (a) How many different arrangements are there of the 10 letters in the word REGENERATE?
- (b) How many different arrangements are there of the 10 letters in the word REGENERATE in which the 4 Es are together and the 2 Rs have exactly 3 letters in between them?
- (c) Find the probability that a randomly chosen arrangement of the 10 letters in the word REGENERATE is one in which the consonants (G, N, R, R, T) and vowels (A, E, E, E, E) alternate, so that no two consonants are next to each other and no two vowels are next to each other.

Solution:**(a)**

Given word
 REGENERATE

total letters = 10
 E, letter repeats = 4 times
 R, letter repeats = 2 times

$$\text{Arrangements} = \frac{10!}{4! 2!}$$

$$= 75600$$

(b)

Given word
REGENERATE

By given condition

GINAT

EEEE

$\textcircled{R} \xleftrightarrow{3!} \textcircled{R}$

consider 4E as one block, total

4 arrangements of ~~block~~ E's in block 4!

As between two R's we need exactly 3 letters, so their arrangements of 3 letters are 3!

$$\text{Total different arrangements} = 4! \times 3! = 144$$

(c)

DATE:-

(15)

Given word

REGENERATE

arrangements of 10 letters

$$= \frac{10!}{4! 2!}$$

$$= 75600$$

4! $\rightarrow$ E, 4 times2! $\rightarrow$ R, 2 times

consonant

(G, N, R, R, T)

vowels

(A, E, E, E, E)

position ways for consonants

$$\frac{5!}{2!} = 60 \quad \because \text{There are 2 R}$$

position ways for vowels

$$\frac{5!}{4!} = 5 \quad \because \text{There are 4 E}$$

so each pattern give $60 \times 5 = 300$

As there are two options consonant can become first or vowels becomes first, so

$$2 \times 300 = 600$$

Thus probability

$$= \frac{\text{favourable ways}}{\text{total ways}} = \frac{600}{75600} = \frac{1}{126}$$

