

Cambridge International AS & A Level

Mathematics

9709/52

Paper 5 Probability & Statistics 1

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Question No (6)

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Question No (6)

(a) Find the number of different ways in which the 10 letters in the word AMALGAMATE can be arranged so that there is an M at the beginning, an M at the end and no As are together.

(b) Find the number of different ways in which the 10 letters in the word AMALGAMATE can be arranged with exactly 3 letters between the two Ms.

Five letters are selected from the 10 letters in the word AMALGAMATE.

(c) Find the number of different selections in which the five letters include at least one M and at least two As.

Solution:

(a) AMALGAMATE

$[M] \quad A A L G A A T E \quad [M]$

$[M] \quad A A A A \quad L G T E \quad [M]$

$[M] \quad \cancel{A} \cancel{A} \cancel{A} \cancel{A} \quad L G T E \quad [M]$

$4! \binom{5}{4}$

$24 \times 5 = 120$

So the different ways are

120

(b) AMALGAMATE

$[M] \quad \cancel{A} \cancel{A} \cancel{A} \quad [M]$

(first letter has 3 options, second has 2 and third has 1)

different ways of arrangement

$A A L G A A T E$ ways

$\frac{8!}{4!}$

$6 \times \frac{8!}{4!} = 10080$

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AMALGAMATE

combination	selections	
MM AAA	1	
MM AA-	C_1^4 4	→ LG A ATE x x
MAA--	C_2^4 6	→ MG A A TE x x
MAAA-	C_1^4 4	→ MGATE x
MAAAA	1	

$$\text{Total different selections} = 1 + 4 + 6 + 4 + 1 = 16$$