Product and Addition Principles (single)

Starter

1. (Review of last lesson) The equation $x^3 + 2x^2 + 3x + 4 = 0$ has roots α, β and γ. Use the substitution method to find equations which have the following roots.
   (a) $2 + \alpha, 2 + \beta$ and $2 + \gamma$ (b) α^2, β^2 and γ^2

2. (Review of GCSE material)
   A restaurant offers courses including 4 starters, 8 main dishes and 5 desserts.
   (a) Sarah will choose one dish from each category. How many times could she visit the restaurant without having the same meal?
   (b) Liam will choose one main dish and a dessert. Ryan will choose a starter and a main dish. Who has more choices and by how many?
   (c) Olivia will choose a main dish and a starter or a dessert. How many options does she have?

Notes

Let $n(A)$ and $n(B)$ be the number of ways of choosing options A and B respectively and let options A and B be ***mutually exclusive***.

N.B. If options A and B be ***mutually exclusive***, it means they cannot be chosen at the same time i.e. there is no overlap in the options. For example, if we are choosing starters and desserts it would mean that none of the starters are included as a dessert.

Product principle: $n(A \text{ and } B) = n(A) \times n(B)$

Addition principle: $n(A \text{ or } B) = n(A) + n(B)$

E.g. 1 Let $n(A) = 5$, $n(B) = 4$ and $n(C) = 7$ with A, B and C being mutually exclusive. Calculate how many ways there are of doing:
(a) A, B and C
(b) A, B or C
(c) A and C only
(d) A and (B or C)
(e) B or (A and C)

E.g. 2 An examination paper has five questions in section A and three questions section B. How many different ways are there is choose questions if you must choose:
(a) one question from each section
(b) a question from either section A or section B.

Solutions to Starter and E.g.s

Exercise

p3 1A Qu 1i, 2-11, (12 red)

Summary

Let $n(A)$ and $n(B)$ be the number of ways of choosing options A and B respectively and let options A and B be ***mutually exclusive***.
Product principle: $n(A \text{ and } B) = n(A) \times n(B)$
Addition principle: $n(A \text{ or } B) = n(A) + n(B)$