Guide to:
The product rule

maths Links

Explanation:

The **product rule for counting** states that if there are **m** ways to make a first choice and **n** ways to make a second choice, the total number of combinations is **m × n**.

If items **cannot be repeated**, reduce the number of available choices by 1 for each next position. If you are choosing a **pair of items where order does not matter** (e.g. picking a team of 2 people or handshakes), divide by **2** at the end so each pair is not counted twice.

Example 1: A restaurant menu has **5 starters**, **8 main courses**, and **4 desserts**. How many different 3-course meals can be chosen?

Solution:

Multiply the number of choices for each course:
Total meals = 5 × 8 × 4
5 × 8 = 40; 40 × 4 = 160
Answer: 160 meals

Example 2: A 4-digit PIN uses digits from **1 to 9** with **no repeated digits**. The first digit must be even (2, 4, 6 or 8). How many PINs are possible?

Solution:

1st digit: **4 choices** (2, 4, 6, or 8)
2nd digit: **8 remaining digits** (from the 9 digits 1–9)
3rd digit: **7 choices**; 4th digit: **6 choices**
Total = 4 × 8 × 7 × 6 = 1344
Answer: 1344 PINs

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