Grade 12 GS

Probability ex 13

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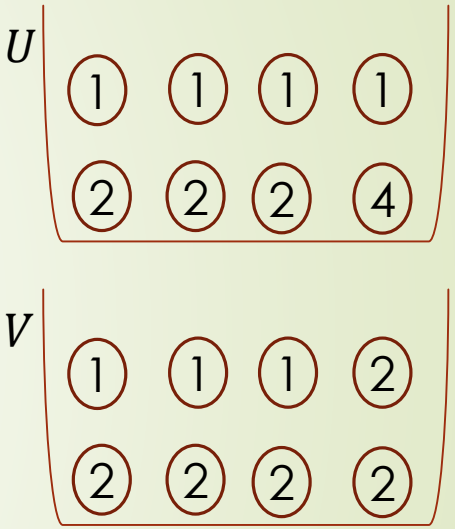
Exercise 13:

Consider two urns **U** and **V**.

Urn **U** contains eight balls: four balls numbered 1, three balls numbered 2 and one ball numbered 4.

Urn **V** contains eight balls: three balls numbered 1 and five balls numbered 2.



1) **Two balls are selected, simultaneously and randomly, from the urn U.**

Consider the following events:

· A : « the two selected balls have the same number »

· B : « the product of the numbers on the two selected balls is equal to 4 ».

- $P(A) = P(1\ 1\ or\ 2\ 2) = \dfrac{C_4^2 + C_3^2}{C_8^2} = \dfrac{9}{28}$
- $P(B) = P(2\ \ 2\ \ or\ \ 1\ 4) = \dfrac{C_3^2 + C_4^1 \times C_1^1}{C_8^2} = \dfrac{1}{4}$

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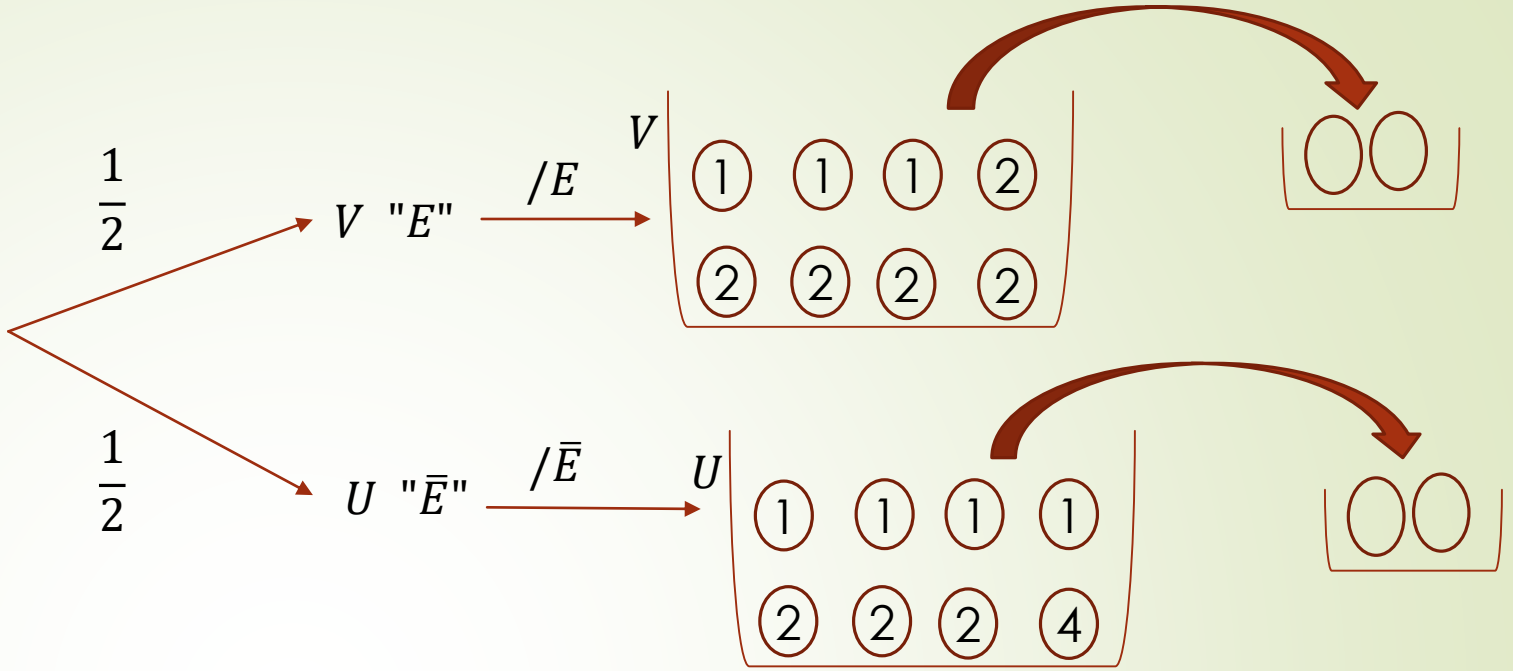
- *Select one of the two urns*:



2) One of the two urns U and V is randomly chosen, and then two balls are simultaneously and randomly selected from this urn.

Consider the following events: E : « the chosen urn is **V** »

F : « the product of numbers on the two selected balls is equal to 4 ».

Verify that P(F ∩ E) = $\frac{5}{28}$, calculate $P(F \cap \bar{E})$ and Deduce P(F).

- $P(F \cap E) = P(F/E) \times P(E) = \frac{C_5^2}{C_8^2} \times \frac{1}{2} = \frac{5}{28}$
- $P(F \cap \bar{E}) = P(F/\bar{E}) \times P(\bar{E}) = \frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$
- $P(F) = P(F \cap E) + P(F \cap \bar{E}) = \frac{5}{28} + \frac{1}{8} = \frac{17}{56}$

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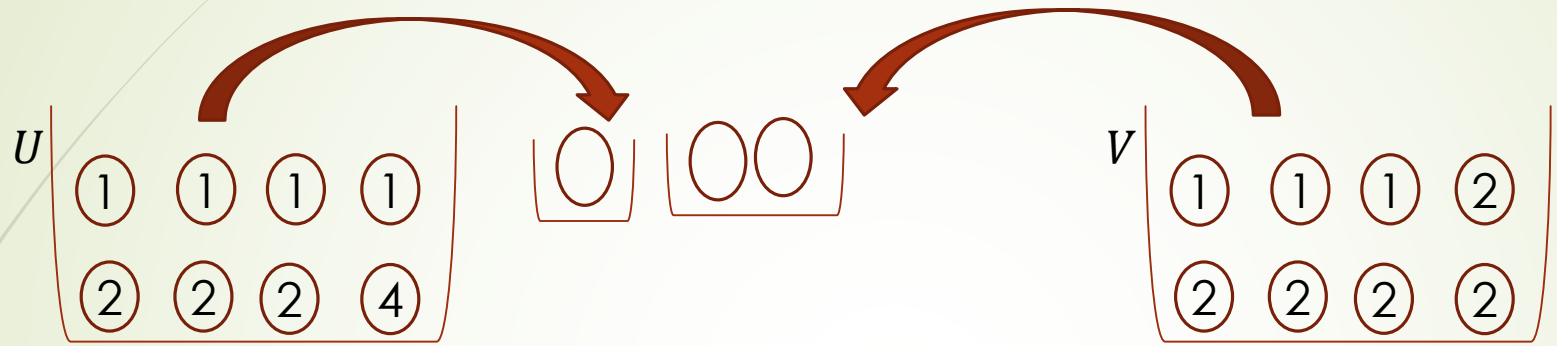
3) **One ball is randomly selected from U, and two balls are randomly and simultaneously selected from V.**

Calculate the probability of event H:« the product of the three numbers on the three selected balls equal to 8 ».



- $P(H) = P(\text{"2 and 2 2" or "4 and 1 2"}) = \frac{C_3^1}{C_8^1} \times \frac{C_5^2}{C_8^2} + \frac{C_1^1}{C_8^1} \times \frac{C_3^1 \times C_5^1}{C_8^2} = \frac{45}{224}$