Question 2

> A **European roulette** consists of a wheel with **37 numbered pockets**, labeled from 0 to 36. The numbers are distributed as follows

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1.

Let the probability space be:

$$
\begin{aligned}
&\Omega = \{0, 1, ..., 36\} \\
&\mathcal{F} = \mathcal{P}(\Omega) \\
&\mathbb{P} : \ \ \mathbb{P}(\{0\}) = \mathbb{P}(\{1\}) = ... = \mathbb{P}(\{36\}) = \frac{1}{37}
\end{aligned}
$$

Then let set $S_{even} \subset \mathcal{F}$ contain all the even number pockets:

$$S_{even} = \{2, 4, ..., 36\}$$

Then we have:

$$\mathbb{P}(S_{even}) = \frac{\#S_{even}}{\#\Omega} = \frac{18}{37}$$

Answer

- $\mathbb{P}(S_{even}) = \frac{18}{37}$

2.

Let set $S_{red} \subset \mathcal{F}$ contain all the red pockets:

$$S_{red} = \{1, 3, ..., 36\}$$

Then we have:

$$\mathbb{P}(S_{red}) = \frac{\#S_{red}}{\#\Omega} = \frac{18}{37}$$

Answer

- $\mathbb{P}(S_{red}) = \frac{18}{37}$

3.

$$\overbrace{\underbrace{\mathbb{P}(S_{red} \cap S_{even}) = \mathbb{P}_{S_{red}}(S_{even})\mathbb{P}(S_{red})}}^{}$$

$$\Downarrow$$

$$\mathbb{P}_{S_{red}}(S_{even}) = \frac{\mathbb{P}(S_{red} \cap S_{even})}{\mathbb{P}(S_{red})}$$

$$= \frac{\mathbb{P}(\{12, 14, ..., 36\})}{\mathbb{P}(S_{red})}$$

$$= \frac{\#\{12, 14, ..., 36\}}{\#S_{red}}$$

$$= \frac{4}{9}$$

Answer

- $\mathbb{P}_{S_{red}}(S_{even}) = \frac{4}{9}$
