

Grade 12 GS

Probability ex 15

K.H

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Exercise 15:

An urn contains five red balls and five green balls.

Three balls are selected, simultaneously and at random, from the urn.

Consider the following events:

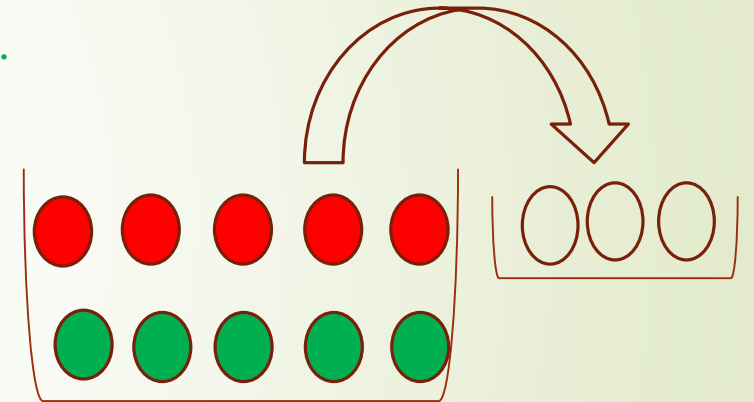
E: « The three selected balls are red ».

F: « Among the three selected balls, there are exactly two red balls ».

S: « Among the three selected balls, there is at most one red ball ».

1) Calculate the probabilities $P(E)$, $P(F)$ and $P(S)$.

- $P(E) = P(3r) = \frac{C_5^3}{C_{10}^3} = \frac{1}{12}$
- $P(F) = P(rr\bar{r}) = \frac{C_5^2 \times C_5^1}{C_{10}^3} = \frac{5}{12}$
- $P(S) = P(1r2\bar{r} \text{ or } 3\bar{r}) = \frac{C_5^1 \times C_5^2 + C_5^3}{C_{10}^3} = \frac{1}{2}$



2) In this question, a game runs in the following way:

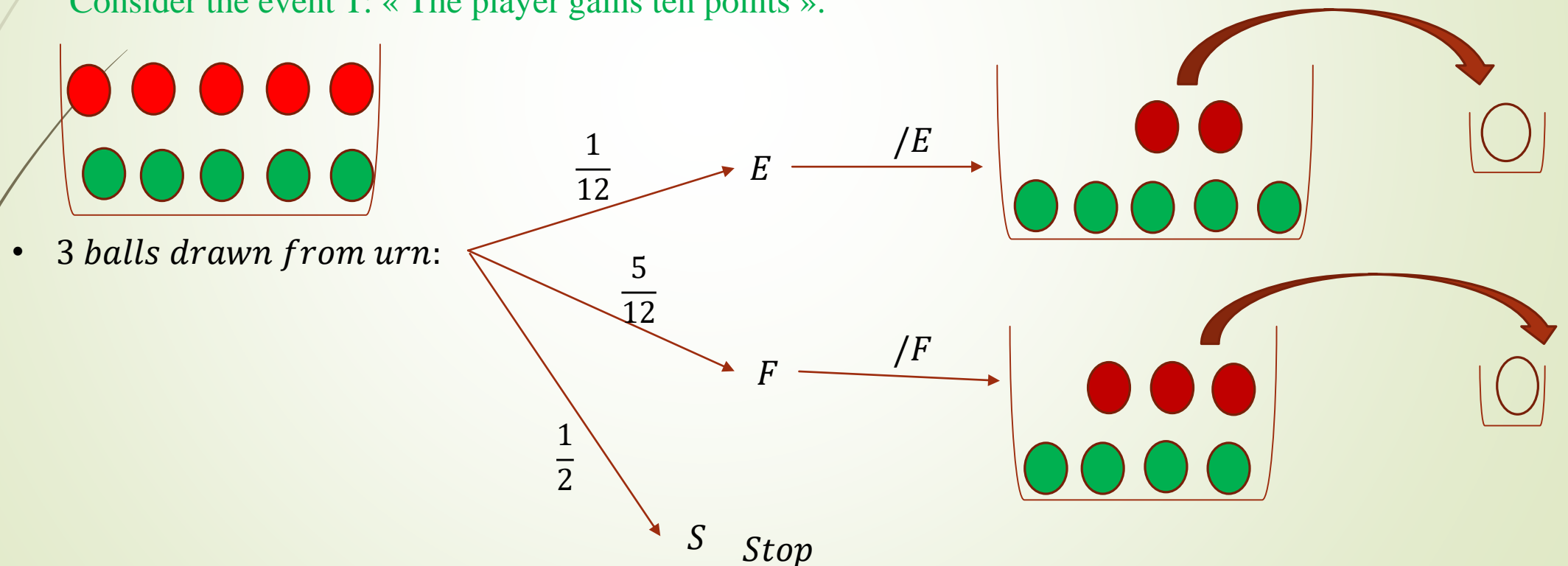
A player selects, simultaneously and at random, three balls from the urn:

If the event S occurs, the player gains **nothing** and the game ends.

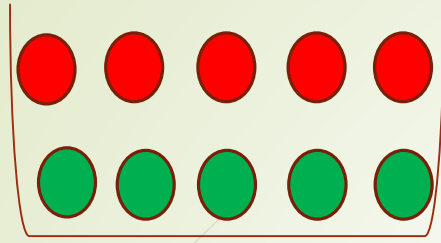
If one of the two events E or F occurs; then the player selects a new ball from the seven remaining balls:

- If this selected ball is green, the player gains 10 points.
- Otherwise, the player gains 2 points.

Consider the event T : « The player gains ten points ».



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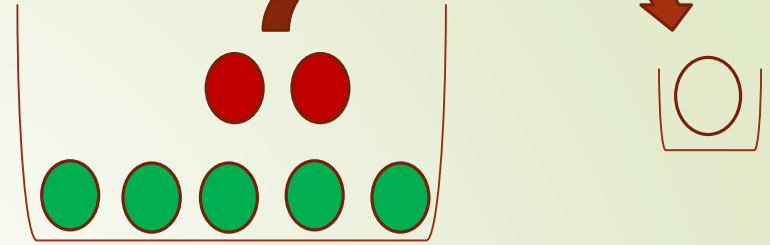


- 3 balls drawn from urn:

$$\frac{1}{12}$$

E

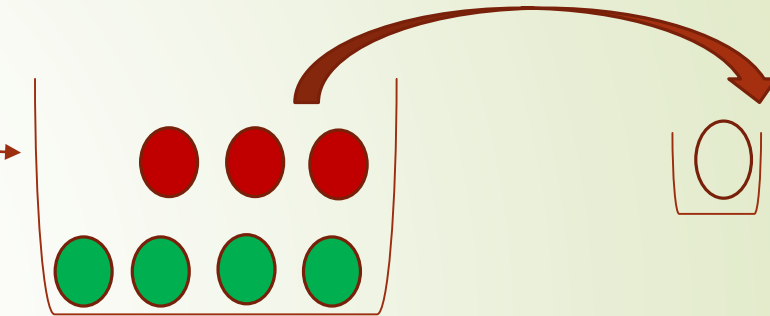
$/E$



$$\frac{5}{12}$$

F

$/F$



$$\frac{1}{2}$$

S Stop

a) Calculate $P(T/E)$ and $P(T/F)$.

$$P(T/E) = \frac{C_5^1}{C_7^1} = \frac{5}{7}$$

$$P(T/F) = \frac{C_4^1}{C_7^1} = \frac{4}{7}$$

b- Calculate $P(T)$.

$$P(T) = P(T \cap E) + P(T \cap F) = P(T/E) \times P(E) + P(T/F) \times P(F)$$

$$= \frac{5}{7} \times \frac{1}{12} + \frac{4}{7} \times \frac{5}{12} = \frac{25}{84}$$

c) Calculate probability he won 2 points..

- $$\begin{aligned}P(R) &= P(R \cap E) + P(R \cap F) = P(R/E) \times P(E) + P(R/F) \times P(F) \\&= \frac{C_2^1}{C_7^1} \times \frac{1}{12} + \frac{C_3^1}{C_7^1} \times \frac{5}{12} \\&= \frac{17}{84}\end{aligned}$$

d) The player gains 10 points. What is the probability that the three selected balls are red?

- $$P(E/T) = \frac{P(T \cap E)}{P(T)} = \frac{\frac{5}{7} \times \frac{1}{12}}{\frac{25}{84}} = \frac{1}{5}$$