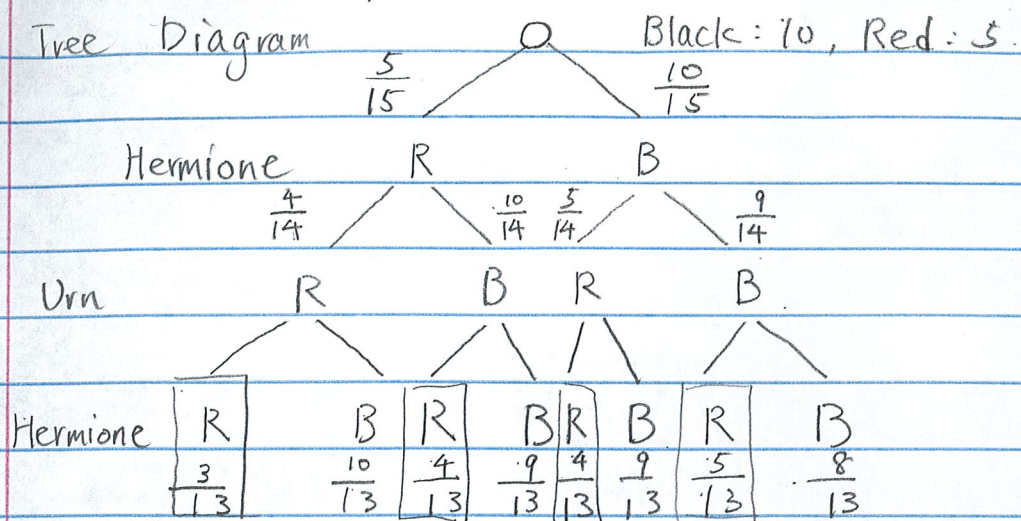


Urn While you learn.

Tree Diagram



We are interested in events such that Hermione draw red ball in her second draw.

The events occurs when $(R, B) = (2, 10), (3, 9), (3, 9), (4, 8)$ balls are left

So when she gets red ball as her 2nd ball and think in terms of ball left, Probability of having 2 red balls and 10 black balls after her second draw is.

$$P(a) = \frac{5}{15} \times \frac{4}{14} \times \frac{3}{13} = \frac{5 \times 4 \times 3}{15 \times 14 \times 13}$$

Probability of having 3 red balls and 9 black balls after her final draw is.

$$P(b) = \frac{5}{15} \times \frac{10}{14} \times \frac{4}{13} = \frac{5 \times 10 \times 4}{15 \times 14 \times 13}$$

Probability of having 4 red balls and 8 black balls after her final draw is.

$$P(c) = \frac{10}{15} \times \frac{9}{14} \times \frac{5}{13} = \frac{10 \times 9 \times 5}{15 \times 14 \times 13}$$

Probability that she drew red ball for her second ball is the sum of those events, so.

$P(\text{Second ball is red}) =$

$$= \frac{5 \times 4 \times 3}{15 \times 14 \times 13} + 2 \left\{ \frac{10 \times 5 \times 4}{15 \times 14 \times 13} \right\} + \frac{10 \times 9 \times 5}{15 \times 14 \times 13}$$

$$= \frac{60}{15 \times 14 \times 13} + \frac{400}{15 \times 14 \times 13} + \frac{450}{15 \times 14 \times 13}$$

$$= 0.33333 = \frac{1}{3}$$