# Probability Assignment 1

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## 1 Problem statement

Two balls are drawn at random with replacement from box containing 10 black and 8 red balls. Find the probability that :

1) both balls are red
2) first ball is black and second ball is red
3) one of them is black the other one is red

## 2 Answer

Assume random variable X and Y:

- X: Colour of first ball picked

$$X = \begin{cases} 1, & \text{for red ball} \\ 0, & \text{for black ball} \end{cases}$$

- Y: Colour of second ball picked

$$Y = \begin{cases} 1, & \text{for red ball} \\ 0, & \text{for black ball} \end{cases}$$

- Both balls are red :

$$= \Pr(X = 1, Y = 1) \tag{1}$$
$$= \frac{8}{18} \times \frac{8}{18} \tag{2}$$
$$= \frac{16}{81} \tag{3}$$

- Both balls are red :

$$= \Pr(X = 0, Y = 1) \tag{4}$$
$$= \frac{10}{18} \times \frac{8}{18} \tag{5}$$
$$= \frac{20}{81} \tag{6}$$

- Both balls are red :

$$= \Pr(X = 1, Y = 0) + \Pr(X = 0, Y = 1) \tag{7}$$
$$= \frac{8}{18} \times \frac{10}{18} + \frac{10}{18} \times \frac{8}{18} \tag{8}$$
$$= \frac{40}{81} \tag{9}$$