Answer on Question #40849 – Math - Other

Question

A company produces plastic elephants in two colours for the novelty trade market. Production in the factory is on one of three machines; 10% is on machine A, 30% on machine B, and the remainder on machine C. Machine A's production consists of 40% blue elephants and 60% pink elephants. Machine B's production consists of 30% blue elephants and 70% pink elephants. Machine C's production has 80% pink elephants with the remainder being blue.

2.1.1 What proportion do blue elephants form of total production?

2.1.2 If a particular elephant is pink, what is the probability it was made by machine B?

Solution

Brief

2.1.1.

$\mathbf{T_B / T} = 0.4 \cdot 0.1 + 0.3 \cdot 0.3 + 0.2 \cdot 0.6 = \mathbf{0.25}$ or 1 / 4,

where T_B – total production of blue elephants, T – total production.

2.1.2.

$\mathbf{P} = B_P / T_P = 0.7 \cdot 0.3 / (0.6 \cdot 0.1 + 0.7 \cdot 0.3 + 0.8 \cdot 0.6) = \mathbf{0.28}$,

where P – the probability, T_P – total production of pink elephants, B_P – production of pink elephants on machine B.

Detailed

Let's assign T – total production of the elephants, A – production on machine A, B – production on machine B, C – production on machine C.

The production of the elephants on each particular machine:

$A = T \cdot 10\% / 100\% = 0.1 \cdot T$

$B = T \cdot 30\% / 100\% = 0.3 \cdot T$

$C = T \cdot (100\% - 10\% - 30\%) / 100\% = T \cdot 60\% / 100\% = 0.6 \cdot T$

The production of blue elephants on each particular machine:

$A_B = A \cdot 40\% / 100\% = 0.4 \cdot A = 0.4 \cdot 0.1 \cdot T = 0.04 \cdot T$

$B_B = B \cdot 30\% / 100\% = 0.4 \cdot B = 0.3 \cdot 0.3 \cdot T = 0.09 \cdot T$

$C_B = C \cdot (100\% - 80\%) / 100\% = C \cdot 20\% / 100\% = 0.2 \cdot C = 0.2 \cdot 0.6 \cdot T = 0.12 \cdot T$

The production of pink elephants on each particular machine:

$A_P = A \cdot 60\% / 100\% = 0.6 \cdot A = 0.6 \cdot 0.1 \cdot T = 0.06 \cdot T$

$B_P = B \cdot 70\% / 100\% = 0.7 \cdot B = 0.7 \cdot 0.3 \cdot T = 0.21 \cdot T$

$C_P = C \cdot 80\% / 100\% = 0.8 \cdot C = 0.8 \cdot 0.6 \cdot T = 0.48 \cdot T$

Total production of blue elephants:

$T_B = A_B + B_B + C_B = 0.04 \cdot T + 0.09 \cdot T + 0.12 \cdot T = (0.04 + 0.09 + 0.12) \cdot T = 0.25 \cdot T$

So, the proportion of blue elephants of total production:

$\mathbf{T_B / T} = 0.25 \cdot T / T = \mathbf{0.25}$ or 1 / 4

Total production of pink elephants:

$T_P = A_P + B_P + C_P = 0.06 \cdot T + 0.21 \cdot T + 0.48 \cdot T = (0.06 + 0.21 + 0.48) \cdot T = 0.75 \cdot T$

The probability the particular pink elephant was made by machine B:

$\mathbf{P} = B_P / T_P = 0.21 \cdot T / 0.75 \cdot T = \mathbf{0.28}$

Answers:

2.1.1) **0.25**

2.1.2) **0.28**