Answer on Question #42681-Math- Statistics and Probability

A company produces plastic elephants in two colors 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.

$$\frac{T_B}{T} = 0.4 \cdot 0.1 + 0.3 \cdot 0.3 + 0.2 \cdot 0.6 = 0.25,$$

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

2.1.2.

$$P = \frac{B_P}{T_P} = \frac{0.7 \cdot 0.3}{0.6 \cdot 0.1 + 0.7 \cdot 0.3 + 0.8 \cdot 0.6} = 0.28,$$

where P is the probability, T_P is total production of pink elephants, B_P is 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:

$$A = T\frac{10\%}{100\%} = 0.1 \cdot T, \qquad B = T\frac{30\%}{100\%} = 0.3 \cdot T, \qquad C = T\frac{100\% - 30\% - 10\%}{100\%} = 0.6 \cdot T.$$

The production of blue elephants on each particular machine:

$$A_B = A\frac{40\%}{100\%} = 0.4 \cdot A = 0.04 \cdot T, \qquad B_B = B\frac{30\%}{100\%} = 0.3 \cdot B = 0.09 \cdot T,$$

$$C_B = C\frac{100\% - 80\%}{100\%} = 0.2 \cdot C = 0.12 \cdot T.$$

The production of pink elephants on each particular machine:

$$A_P = A\frac{60\%}{100\%} = 0.6 \cdot A = 0.06 \cdot T, \qquad B_P = B\frac{70\%}{100\%} = 0.7 \cdot B = 0.21 \cdot T,$$

$$C_P = C\frac{80\%}{100\%} = 0.8 \cdot C = 0.48 \cdot T.$$

Total production of blue elephants:

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

So, the proportion of blue elephants of total production:

$$\frac{T_B}{T} = \frac{0.25 \cdot T}{T} = 0.25.$$

Total production of pink elephants:

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

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

$$P = \frac{B_P}{T_P} = \frac{0.21 \cdot T}{0.75 \cdot T} = 0.28.$$

Answer: 2.1.1) 0.25; 2.1.2) 0.28.