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PROBABILITY & STATISTICS

(1.)

Let us use a frequency value of a deterministic colour of flight aircraft that disappear

Let,

Such aircrafts, $N = 100$

Discovered aircrafts = 80% ∈ D group

aircrafts belonging to $\bar{D}$ = 20%

Among 80%, 70% have an emergency locator, so

$$D \cap L = (80)(0.7) = 56$$

Here, event that aircraft has an emergency locator = L.

⇒ Thus total aircrafts that were discovered but had no emergency locator:

$$D \cap \bar{L} = (80)(0.3) = 24$$

Ily,

Among the 20 undiscovered aircrafts following had no emergency locator

$$\bar{D} \cap \bar{L} = (20)(0.87) = 17.4$$

& following had an emergency locator

$$\bar{D} \cap L = (20)(0.13) = 2.6$$

Thus, probability that an aircraft that has disappeared & does not have an emergency locator will be located is = 0.5797 :

(2)

It is given that,

P(patient dies if he receives drug) = $\frac{9}{17} \approx 0.5294$

Total no. of patients to receive drug (n) = 8

If,

no. of patients that will die = x

$\Rightarrow$

According to Binomial distribution,

$$P(X = x) = \binom{n}{x} p^x (1-p)^{n-x}$$

Thus,

P(Atleast 7 patients will die) = $P(X \geq 7)$

$$P(X \geq 7) = P(X=7) + P(X=8)$$

$$= \binom{8}{7} (0.5294)^7 (1-0.5294)^{8-7} + \binom{8}{8} (0.5294)^8 \cdot (1-0.5294)^{8-8}$$

$$= 0.0439 + 0.0062$$

$$= 0.0501$$

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(3) Here, it is given that

$p = 0.43$

$n = 49$

First, we should check our conditions for the sampling distribution of no sample proportion.

$np = (0.43)(49) = 21.07$

& $n(1-p) = (49)(1-0.43) = 27.93$

which is greater than 5.

Since, the conditions are satisfied, $\hat{p}$ will be, a sampling distribution that is approximately normal with mean $\mu = 0.43$ & standard deviation is-

$$S.D = \sqrt{\frac{0.43(1-0.43)}{49}} = 0.0707$$

$$P(0.45 < \hat{p} < 0.5) = P\left(\frac{0.45-0.43}{0.0707} < \frac{\hat{p}-p}{\sqrt{\frac{p(1-p)}{n}}} < \frac{0.5-0.43}{0.07}\right)$$

$$\approx P(0.0282 < Z < 1)$$

$$= P(Z < 1) - P(Z < 0.28)$$

$$= 0.8413 - 0.6126$$

$$= 0.2287$$

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Thus, if true proportion of Indians who own an iphone is 43%, then there would 22.87% chance that we would see a sample proportion b/w 45% & 50%.