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1.) Probability that man speaks truth = 3/4.
The probability that man lies is = $1-3/4 = 1/4$
Probability of getting 6 on die = $1/6$
Probability of not getting 6 = $1-1/6 = 5/6$

Applying bayes theorem, we get the required probability as:

$$= \frac{1/6 \times 3/4}{(1/6 \times 3/4) + (5/6 \times 1/4)}$$

$$= \frac{3}{8}$$

here, applying formula: $P(A|B) = \frac{P(B|A) \cdot P(A)}{P(B)}$

where $P(B) = \left(\frac{1}{6} \times \frac{3}{4}\right) + \left(\frac{5}{6} \times \frac{1}{4}\right)$

and $P(B|A) = 1/6$ and $P(A) = 3/4$

where A → suggest that man speaks truth.
B → suggest that he got 6 on die.

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Q-1 B)2 here,

Let E_1 = plant A manufactues ~~see~~ bike.
E_2 = plant B manufactures bike.

A = Bike is of standard quality.

$P(E_1) = 70\% = \frac{70}{100} = 0.7$ ($\because$ bike manufactured by Plant A)

$P(E_2) = 30\% = \frac{30}{100} = 0.3$ ($\because$ bike manufactured by Plant B)

By ~~ap~~ $P(A/E_1) = 80\% = \frac{80}{100} = 0.8$

($\because$ standard quality bikes manufactured by Plant A).

$P(A/E_2) = 90\% = \frac{90}{100} = 0.9$

($\because$ standard quality bikes manufactured by Plant B)

By applying Baye's theorem;

$$P(E_2/A) = \frac{P(E_2)\,P(A/E_2)}{P(E_2)\,P(A/E_2) + P(E_1)\cdot P(A/E_1)}$$

$$= \frac{0.3 \times 0.9}{(0.3 \times 0.9) + ((0.7)(0.8))}$$

$$= \frac{27}{83} \approx 0.325$$

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Q-2 Probability of a defect per blade $p = \frac{1}{500}$ or 0.002

$\therefore$ The mean number of defects = $L = 10p = np = 0.02$
where p is the probability of the number of the defects, and $n = 10$ which is packet of 10.
$L = np = 10p = 10 \times 0.002 = 0.02$

$$\therefore P(n) = \frac{L^n}{n!} e^{-L}$$

$$= \frac{(0.02)^n}{n!} e^{-0.02} = \frac{(0.02)^n}{n!} \times (0.98)$$

(i) The approximate number of packets containing zero defective blades.

$\cancel{P(3) = \frac{(0.03)^2}{3!} \times (0.98)}$ $P(0) = \frac{(0.02)^0}{0!} e^{-0.02}$

≈ 0.98.

$\rightarrow$ number of packets = $10000 \times P(0) = 9800$

(ii) The approx number of packets containing one defective blades:

$P(1) = \frac{(0.02)^1}{1!} \times 0.98 = 0.0196$

$\rightarrow$ number of packets = $10000 \times P(1) = 196$

iii) The approx number of packets containing two defective blades =

$P(2) = \frac{(0.02)^2}{2!} \times 0.98 = 1.96 \times 10^{-4}$

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— number of packets = $10000 \times 1.96 \times 10^{-4} \approx 2$

∴ answers :

1. two defective blades:

The approximate number of packets containing blades with two defective blades is $\underline{\underline{2}}$

2. at least two defective blades

$= 1 - (P(0 \text{ def. blades}) + P(1 \text{ def. blades}))$

$= 1 - (0.98 + 0.0196)$

$= 4 \times 10^{-4}$

∴ number of packets containing blades with at least two defective blades is

$4 \times 10^{-4} \times 10000 = \underline{\underline{4}}$.

Q-3 Total brass plugs = 1000

$\mu = 0.7515$ cm

$\sigma = 0.002$ cm.

approved diameter = 0.752 ± 0.004 cm

$$Z = \frac{(x-\mu)}{\sigma}$$

* here for x we have to take LSL & USL

where LSL = 0.752 − 0.004 = 0.748
USL = 0.752 + 0.004 = 0.756

$$z \text{ (for } x = LSL) = \frac{0.748 - 0.7515}{0.0020}$$
$$= -1.75$$

$$z \text{ (for } x = USL) = \frac{0.756 - 0.7515}{0.002}$$
$$= 2.25$$

from table,
Area at z = 2.25 is 0.4878
Area at z = 1.75 is 0.4599

∴ Total area = 0.4878 + 0.4599
= 0.9477.

→ Brass plugs likely to be approved =
$\frac{0.9477}{1} \times 1000$

= 947.7 ≈ 948 plugs

∴ The number of plugs likely to be grejected is
1000 − 948
= $\boxed{52 \text{ plugs}}$

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4.) Probability of man hetting target = $1/3$.

here ; $p = 1/3$

So suppos man fires n times, and ~~X~~ let X denotes the number of times he hits the target.

$P(X=r) = {}^nC_r \left(\frac{1}{3}\right)^{r} \left(\frac{2}{3}\right)^{n-r}$, where $r = 0, 1, 2, \ldots, n$.

It is given that

$P(X \geq 1) > \frac{3}{4}$

(∵ man hits target atleast ones) is gr

(∵ hits zero time)

$1 - P(X=0) > \frac{3}{4}$

$1 - {}^nC_0 (1/3)^{0} (2/3)^{n-0} > \frac{3}{4}$

$1 - \left(\frac{2}{3}\right)^n > \frac{3}{4}$

$\frac{1}{4} > \left(\frac{2}{3}\right)^n$

∴ so we can see that n should be 4 so that $1/4 \approx 0.25 > \left(\frac{2}{3}\right)^4 \approx 0.197$

∴ The man must fire at least 4 times

∴ $\boxed{n=4}$

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4 B) Total questions : 8
smallest value of $n = ?$
probability of guessing at least n correct answer $= \frac{1}{2}$

here, Let $X =$ no of ~~probal~~ he guesses right.

If he has to guess at least n correct answer, then we can show that ~~the~~ ~~slso~~

$= 1 -$ (guessing at most $n-1$ correct answers)

$= 1 - \left({}^8C_0 \left(\frac{1}{2}\right)^8 + {}^8C_1 \left(\frac{1}{2}\right)^8 + \dots + {}^8C_{n-1} \left(\frac{1}{2}\right)^8 \right)$

[∵ here by burnolwii probability distribution formula we applied.
$P(n) = {}^8C_n \left(\frac{1}{2}\right)^n \left(\frac{1}{2}\right)^{8-n} = {}^8C_n \left(\frac{1}{2}\right)^8$]

in question it is given that this probability should be less than $\frac{1}{2}$

$\therefore 1 - \left(\left(\frac{1}{2}\right)^8 \left({}^8C_0 + {}^8C_1 + \dots + {}^8C_{n-1} \right) \right) < \frac{1}{2}$

$\therefore 1 - \frac{1}{2} < \left(\frac{1}{2}\right)^8 \left({}^8C_0 + {}^8C_1 + \dots + {}^8C_{n-1} \right)$

$\therefore \frac{1}{2} < \left(\frac{1}{2}\right)^8 \left({}^8C_0 + {}^8C_1 + \dots + {}^8C_{n-1} \right)$

$\therefore {}^8C_0 + {}^8C_1 + \dots + {}^8C_{n-1} > (2)^7$

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5.)

x	0	1	2	3	4	5	6	7
f	0	K	$2K$	$2K$	$3K$	K^2	$2K^2$	$7K^2+K$

here we know that $\Sigma p(x) = 1$

$\therefore$ $0+K+2K+2K+3K+K^2+2K^2+7K^2+K=1$

$\therefore$ $10K^2+9K=1$

$\therefore$ $\cancel{10K^2+9K-1=0}$ $\therefore$ $10K(K+1)-K(K+1)=0$

$\therefore$ $\cancel{K=0.100\ 925}$ $\therefore$ $K=1/10$.

Mean $= 4K+K+6K+12K+5K^2+12K^2+49K^2+7K$

$= 30K + 66K^2$

Mean $= 3.66$

$\Sigma(P(x^2)) = K + 8K + 18K + 48K\ 125K^2 + 72K^2$
$+ 343K^2 + 49K$

$= 124 + 440K^2$

$= 12.4 + 4.4$

16.8

$\sigma^2 = 16.8\ (\text{Mean})^2$

$= 3.4$