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Course Name IT302

Date - 27^{th} Sep 2020

Q.1 If x is random variable which represents the number of green balls drawn in 3 attempts

~~the~~ $\therefore$ x can assume values 0, 1, 2, 3.

Because of replacement of balls, before each draw there are 4 black balls and 2 green balls in the box

That means the probability of green ball being drawn is alaway $2/6 = 1/3$

While the probability of black ball being drawn is always $4/6 = 2/3$

$\therefore$ probability distribution is.

$$p(X=x) = \left(\frac{1}{3}\right)^{x}\left(\frac{2}{3}\right)^{3-x}$$

$$= \frac{1}{3^x} \times \frac{(2)^{3-x}}{(3)^{3-x}}$$

$$= \frac{2^{3-x}}{3^x \times 3^{3-x}}$$

$$= \frac{2^{3-x}}{3^3} = \frac{2^{3-x}}{27}$$

$$\boxed{P(X=x) = \frac{2^{3-x}}{27}}$$ — **Ans**

Q.2 Consider the following events.

D : The product is defective.

B_1 : The product is made by machine B_1

B_2 : The product is made by machine B_2

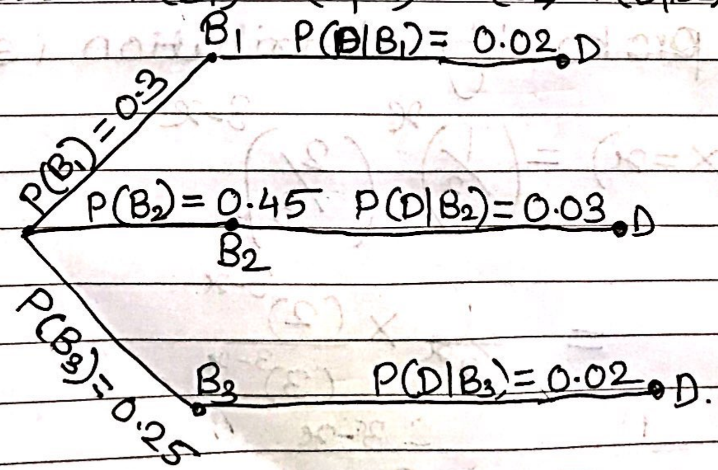
B_3 : The product is made by machine B_3

Applying the rule of elimination we can write

$\cancel{p(A) = P(B_1) \times}$

$\cancel{p(D) = p(B_1) \times p(D|B_1) + p(B_2)}$

$$P(D) = P(B_1) \times P(D|B_1) + P(B_2) \times P(D|B_2) + P(B_3) \times P(D|B_3)$$



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Q.2

$P(B_1) \times P(D|B_1) = 0.3 \times 0.02 = 0.006$ — (1)

$P(B_2) \times P(D|B_2) = 0.45 \times 0.03 = 0.0135$ — (2)

$P(B_3) \times P(D|B_3) = 0.25 \times 0.02 = 0.005$ — (3)

$$P(A) = P(B_1) \times P(D|B_1) + P(B_2) \times P(D|B_2) + P(B_3) \times P(D|B_3)$$

$$= 0.006 + 0.0135 + 0.005$$

$$= 0.0245$$

$$\boxed{P(A) = 0.0245}$$ Answer

Q.3 T is a random variable which represents the total worth of selected coins.

T can assume 3 different values.

If all 3 selected coins are dimes,

$T = 3 \times 10 = 30.$

If ~~all~~ we have selected 2 dimes and 1 nickel

$T = 2 \times 10 + 1 \times 5 = 25$

If we have selected 1 dime and 2 nickels

$T = 1 \times 10 + 2 \times 5 = 20$

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3 nickels and no dimes can't be selected since only 2 nickels are present in the box.

The total number of ways to make a selection

$$= {}^{6}C_{3} = \frac{6!}{3! \times (6-3)!}$$

$$= \frac{6!}{3! \times 3!}$$

$$= \frac{\cancel{6} \times 5 \times 4}{\cancel{3 \times 2 \times 1}}$$

$$= 20 \text{ ways}$$

We get T=30 when we select 3 dimes from the box which can be done in ${}^{4}C_{3}$ way.

$$= {}^{4}C_{3}$$

$$= \frac{4!}{3! \times (4-3)!}$$

$$= \frac{4!}{3!}$$

$$= 4 \text{ ways}$$

$$P(T=30) = \frac{{}^{4}C_{3}}{{}^{6}C_{3}} = \frac{4}{20} = \frac{1}{5}$$

$$\boxed{P(T=30) = \frac{1}{5}}$$

We obtain T=25 when we select 2 dimes and 1 nickel from the box. Which can be done in ${}^4_2C \times {}^2_1C$ ways.

$${}^4_2C \times {}^2_1C = \frac{4!}{2! \times 2!} \times \frac{2!}{1!}$$

$$= \frac{4 \times 3 \times 2}{2}$$

$$= 12 \text{ ways}$$

$$P(T=25) = \frac{{}^4_2C \times {}^2_1C}{{}^6_3C} = \frac{12}{20} = 3/5$$

$$\boxed{P(T=25) = 3/5}$$

We obtain T=20 when we select 1 dime and 2 nickels from the box. Which can be done in ${}^4_1C \times {}^2_2C$ ways.

$${}^4_1C \times {}^2_2C = \frac{4!}{1! \times 3!} \times \frac{2!}{2!}$$

$$= 4 \text{ ways}$$

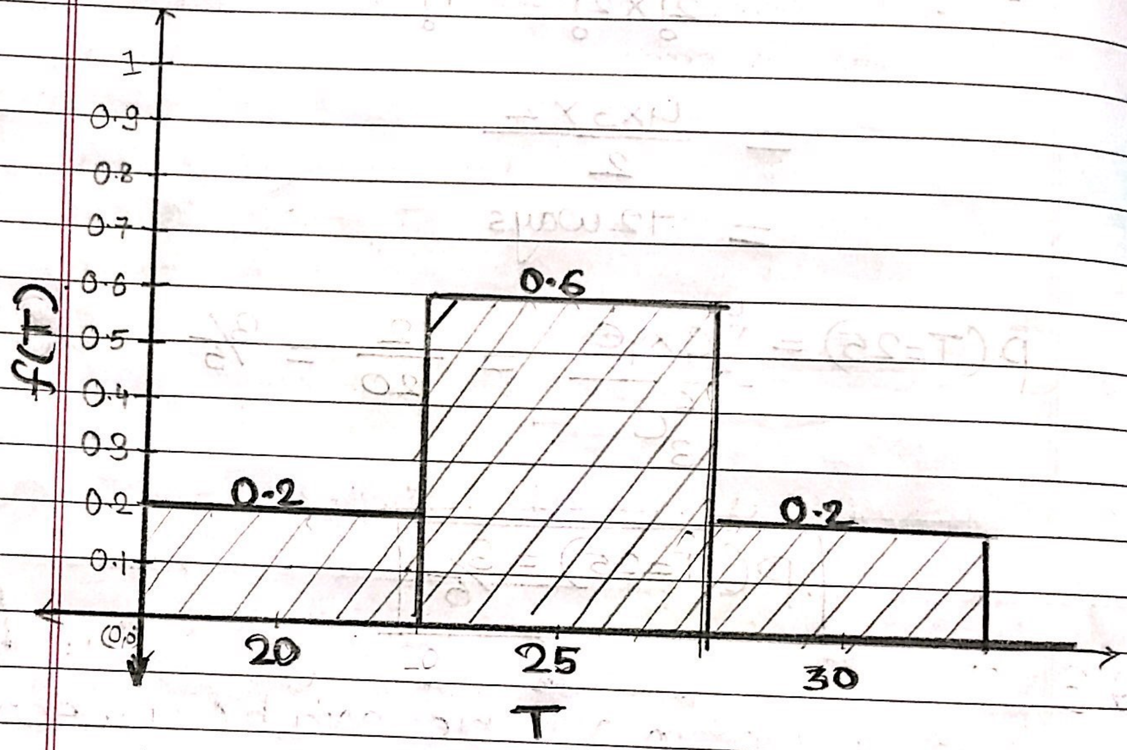
$$P(T=20) = \frac{{}^4_1C \times {}^2_2C}{{}^6_3C} = \frac{4}{20} = \frac{1}{5}$$

$$\boxed{P(T=20) = \frac{1}{5}}$$

∴ probability distribution.

T	20	25	30
f(T)	1/5	3/5	1/5

probability histogram.



Q.4

x	-3	6	9
$f(x)$	$1/6$	$1/2$	$1/3$

$g(x) = (2x+1)^2$

To find - $\mu g(x)$

$\because$ x is discrete,

$$\mu g(x) = E((g(x))) = \sum_{x} g(x) \times f(x)$$

We have given $g(x) = (2x+1)^2$

$\because g(-3) = (2 \times -3 + 1)^2$

$= (-6+1)^2$

$= (-5)^2$

$\boxed{g(-3) = 25}$

$\because g(6) = (2 \times 6 + 1)^2$

$= (13)^2$

$\boxed{g(6) = 169}$

$\because g(9) = (9 \times 2 + 1)^2$

$= (19)^2$

$\boxed{g(9) = 361}$.

$\therefore \cancel{\mu_{g(x)}}$

$$\therefore \mu_{g(x)} = \sum_x g(x) \times f(x)$$

$$\mu_{g(x)} = g(-3) \times f(-3) + g(6) \times f(6) + g(9) \times f(9)$$

$$= 25 \times \frac{1}{6} + 169 \times \frac{1}{2} + 361 \times \frac{1}{3}$$

$$= \frac{25}{6} + \frac{169 \times 3}{6} + \frac{361 \times 2}{6}$$

$$= \frac{25}{6} + \frac{507}{6} + \frac{722}{6}$$

$$= \frac{1254}{6}$$

$$\boxed{\mu_{g(x)} = 209}$$

Ans.