Q no 1

With three fair six-sided dice (Faces numbered 1-6), the their possible outcomes would be,

$$6 \times 6 \times 6 = 6^3 = 216 \text{ possible outcomes.}$$

Only one of these is three 1s (the only one way to total 3) (1,1,1)

$$\frac{1}{6} \times \frac{1}{6} \times \frac{1}{6} = \frac{1}{216}$$ Ans

Q no 2

let the events be as follows:

V- Vegeterian

B- Brocoli

We are given that,

$P(B) = 0.8$

$P\left(\frac{B}{V'}\right) = 0.4$

We have to find,

$P\left(\frac{V}{B}\right) = ?$

→

$P\left(\frac{V}{B}\right) = ?$

Now by bayes theorem we have,

$$P\left(\frac{V'}{B}\right) = \frac{P(V')\,P\left(\frac{B}{V'}\right)}{P(B)}$$

$$= \frac{0.75 \times 0.4}{0.8}$$

Therefore, the complementary event is,

$$P\left(\frac{V}{B}\right) = 1 - P\left(\frac{V'}{B}\right)$$

$$P\left(\frac{V}{B}\right) = 1 - \frac{0.75 \times 0.4}{0.8}$$

$$P(V/B) = 0.625$$ Ans

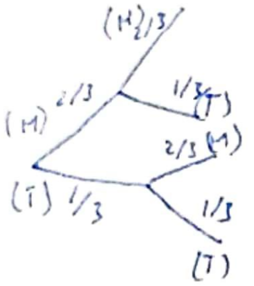
Q no 3

Explanation by solution.

Given that:

$P(H) = \frac{2}{3}$

$P(T) = \frac{1}{3}$



$H = \frac{2}{3} \times \frac{2}{3} = \frac{4}{9}$

$T = \frac{2}{3} \times \frac{1}{3} = \frac{2}{9}$

$H = \frac{1}{3} \times \frac{2}{3} = \frac{2}{9}$

$T = \frac{1}{3} \times \frac{1}{3} = \frac{1}{9}$

Event A is defined as first toss is a Tail.

$\Rightarrow A : \{(T, H), (T, T)\}$

Event B is defined as both tosses are sam.

$\Rightarrow B : \{(T,T), (H.H)\}$

From the tree diagram

$\Rightarrow P(A) = \frac{1}{3} \times \frac{2}{3} + \frac{1}{3} \times \frac{1}{3}$

$= \frac{1}{3}$

$\Rightarrow P(B) = \frac{2}{3} \times \frac{2}{3} + \frac{1}{3} \times \frac{1}{3}$

$= \frac{5}{9}$

⇒ Two events are independent if the result of the second event is not affected by the result of the first event. Therefore these events are independent.

Q no 4

Given that,

let S be the sample space

$A = \{x : x \in N, x < 6\}$

$= \{1, 2, 3, 4, 5\}$

$B = \{x : x \in N, 4 < x < 10\}$

$= \{5, 6, 7, 8, 9\}$

$A \cap B = \{1, 2, 3, 4, 5\} \cap \{5, 6, 7, 8, 9\}$

$= \{5\}$

Hence, $P(A/B) = \dfrac{P(A \cap B)}{P(B)} \Rightarrow \dfrac{\frac{n(A \cap B)}{\cancel{n(S)}}}{\frac{n(B)}{\cancel{n(S)}}} \Rightarrow \dfrac{n(A \cap B)}{n(B)}$

$\boxed{P(A/B) = \frac{1}{5}}$

Directly, we can apply Multipication Theorem of Probability. In order to apply Baye's theorem, we need to have the collection of mutually exclusive and exhaustiven events, which are not given in the problem.

Q no 5

Container 1: 2 tape balls, 3 Football
Container 2: 4 tape balls, 1 Footballs
Container 3: 3 Tape balls, 4 Foot balls.

Tapeball = TB
Container 1 = C1
" 2 = C2
" 3 = C3

Here the cube has 3 pinks, 2 yellows & 2 green faces
If pink face comes up we select up the container 1.

So, the probability of selecting container 1 is given by,

P(container 1) = 3/6

Similarly, P(container 2) = 2/6

P(container 3) = 1/6

$\Rightarrow P(TB/C1) = \frac{2}{5}$

$\Rightarrow P(TB/C2) = \frac{4}{5}$

$\Rightarrow P(TB/C3) = \frac{3}{7}$

we have to find if a ball is randomly chosen which is a tape ball, probability that the cube had come up with the pink face that is the ball drawn from container 1

i.e P(C1/TB) → By using Baye's theorem,

$$P(C1/TB) = \frac{P(TB/C1)P(C1)}{P(TB/C1)P(C1) + P(TB/C2) + P(TB/C3)P(C_r)}$$

$$= \frac{\frac{2}{5} \times \frac{3}{6}}{\left(\frac{2}{5} \times \frac{3}{6}\right) + \left(\frac{4}{5} \times \frac{2}{6}\right) + \left(\frac{3}{7} \times \frac{1}{6}\right)} \Rightarrow \frac{42}{113}$$

$P(C1/TB) = \frac{42}{113}$ Ans

Q no 6

let S be the sample space.

Then n(S) = number of ways of drawing 2 balls out of (6+4) = 10

∵ Solve it by combination ⇒ $^{10}C_2 = \frac{10 \times 9}{2 \times 1} = 45$

let E = event of getting both balls of same colours.

Then n(E) = no. of ways (2 balls out of six) or (2 balls out of 4)

$= {}^{6}C_2 + {}^{4}C_2$

$= \frac{6 \times 5}{2 \times 1} + \frac{4 \times 3}{2 \times 1} = 15 + 6 = 21$

$P(E) = \frac{n(E)}{n(S)}$

$= \frac{21}{45}$

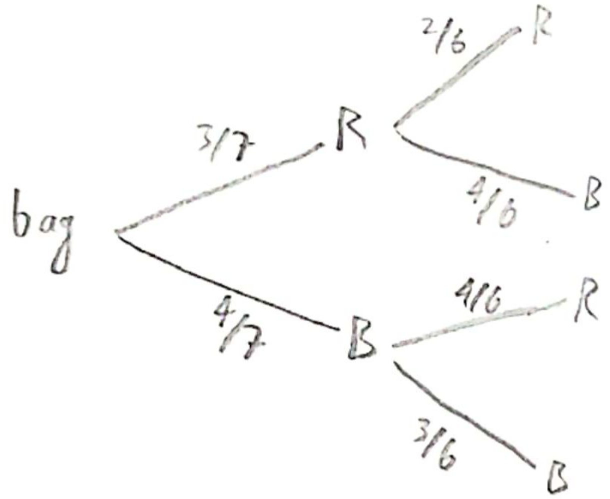
$P(E) = \frac{7}{15}$ Ans

Q no 7

red counter = 3

blue counters = 4

If he takes 2 random counters from bag
Probability that both counters are of same colour?



Extra: Total counters = 7
takes = 2
$^7C_2 = 21$ (sample space)

From red $= {}^3C_2 = 3$

From blue $= {}^4C_2 = 6$

$3 + 6 = 9$

$P(E) = \frac{n(E)}{n(S)}$

$P(E) = \frac{9}{21} \Rightarrow \frac{3}{7}$ Ans

Sample space for being same colour = {RR + BB}

$$= \left(\frac{3}{7} \times \frac{2}{6}\right) + \left(\frac{4}{7} \times \frac{3}{6}\right)$$

$$= \frac{1}{7} + \frac{2}{7}$$

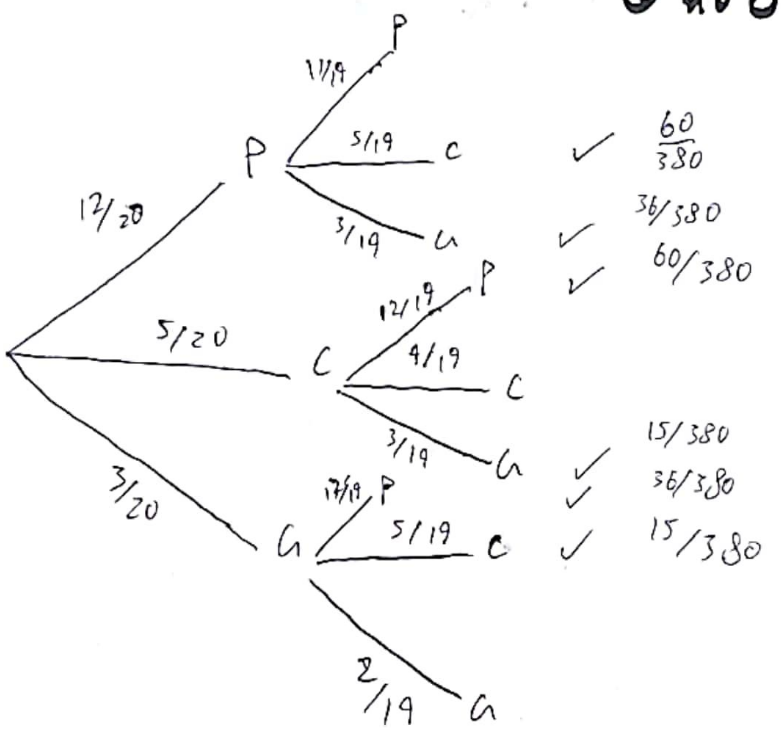
$$= \frac{3}{7} \quad \text{Ans}$$

$\frac{3}{7}$ is the probability of being same colour of counters.

Q no 8

P = Plain biscuits
C = chocolate ..
G = Ginger ..

{which are not of same type}



Favourable outcomes:

$$= \frac{60}{380} + \frac{36}{380} + \frac{60}{380} + \frac{15}{380} + \frac{36}{380} + \frac{15}{380}$$

$$= \frac{222}{380}$$

Prob. that are not of same type $= \frac{111}{190}$

Q no 9

Total no. of students = 8

(a)

Nobody has a birthday on the same day.

1 year = 365 day ⇒ 365 - 7 = 358

$$P(x=0) = \frac{365 \times 364 \times 363 \times 362 \times 361 \times 360 \times 359 \times 358}{(365)^8}$$

$= 0.92566$ Ans

(b)

At least 2 have same birthdays on the same ~~day~~ date

$1 - P(x=0) = 1 - 0.92566$

$= 0.074335$

c

Exactly 2 have same birthday.

$$P(x=2) = \left[\frac{365 \times 1 \times 364 \times 363 \times 362 \times 361 \times 360 \times 359}{(365)^8} \right] \times {}^8C_2$$

$= 0.07239$ Ans

d

Exactly 3 have same bithdy

$$P(x=3) = \left[\frac{365 \times 1 \times 1 \times 364 \times 363 \times 362 \times 361 \times 360}{(365)^{8}} \right] \times {}^{8}C_{r}$$

$$= 0.000403$$

e

4 or 3 have same birthday.

$$P(X=2 \cup X=3) = 0.07239 + 0.000403$$

$$= 0.072793$$

f

At most 3 have same bithday.

$$P(x \leq 3) = P(X=0, X=2, X=3)$$

$$= 0.92566 + 0.072793$$

$$= 0.998453$$

Q no 20

Machine 1 : produces 25% of output (5% are observed to be defective)

Machine 2: produces 30% of output (4% are observed to be defective)

Machine 3: produces 40% of output (2% are observed to be defective)

The probability that the product is defective is

By law of total probability:

$$P(D) = \left(P(i)\,P(D/i)\right) + \left(P(ii)\,P(D/ii)\right) + \left(P(iii)\,P(D/iii)\right)$$

$$P(D) = \left(\frac{25}{100} * \frac{5}{100}\right) + \left(\frac{30}{100} + \frac{4}{100}\right) + \left(\frac{40}{100} * \frac{2}{100}\right)$$

$$P(D) = 0.0125 + 0.012 + 8 \times 10^{-3}$$

$$P(D) = 0.0325$$

Q no 11

Sample space $S = \{(1,1), (1,2), \dots (6,6)\}$

$n(S) = 36$

more than 7, we get.

$E = \{(4,4), (5,3), (3,5), (6,2), (2,6), (3,6), (6,3), (4,5), (5,4)$
$(5,5) (6,4), (4,6), (5,6), (6,5), (6,6)\}$

$n(E) = 15$

$P = \frac{n(E)}{n(S)} = \frac{15}{36}$

$P = \frac{n(E)}{n(S)} = \frac{5}{12}$

Q no 12

Possible outcomes = {HH, HT, TH, TT}

The outcome favourable to no head = {TT}

The outcome favourable to one head = {HT, TH}

∴ The event of obtaining at most one head has 3 favourable outcomes.

These are TT, HT & TH.

the probability of obtaining at most one head $= \frac{3}{4}$

Q no 13(i)

let S denote the sample space
Then $n(S) = 52$

let E = event of drawing a card which is either red or a king.
There are 26 red cards (including 2 red kings) & there are 2 more kings.

$\therefore \; n(E) = 26 + 2 = 28$

Probability of getting a red card or a king is

$$P = \frac{n(E)}{n(S)}$$

$$= \frac{28}{52}$$

$$P = \frac{n(E)}{n(S)} = \frac{7}{13} \quad \underline{\text{Ans}}$$

Q no 13 (ii)

K, L, B, C, A are arranged

What is the Probability of the arranged word being 'BLACK'?

We will use the formula:

$${}^{n}P_{n} = \frac{n!}{(n-r)!}$$; where n is the total numbers & r represents the no. of letters to be arranged

'BLACK' = total numbers = 5.

K, L, B, C, A = no. of letters is also 5.

$${}^{5}P_{5} = \frac{5!}{(5-5)!}$$

$${}^{5}P_{5} = \frac{5!}{0!} \qquad \therefore 0! = 1$$

$${}^{5}P_{5} = 5!$$

$${}^{5}P_{5} = 120$$ Ans

Q no 14

Ali hit a target 3 times in 4 shots $= \frac{3}{4}$

Shahzaib hit a target 2 times in 3 shots $= \frac{2}{3}$

Uzair hit a target 5 times in 6 shots $\frac{5}{6}$

Find probability that none of them will hit the target.

$$P(A) = 1 - \frac{3}{4} = \frac{1}{4}$$

$$P(S) = 1 - \frac{2}{3} = \frac{1}{3}$$

$$P(U) = 1 - \frac{5}{6} = \frac{1}{6}$$

Probability of none of the target ~~hitting~~ hitting the target.

$$P(E) = \frac{1}{4} + \frac{1}{3} + \frac{1}{6}$$

$$P(E) = \frac{3}{4}$$

(16)

Q no 15

Box contains 3 Footballs
4 Cricket balls
5 volley balls

if. 3 balls are drawn in succession with replacement. What is the probability of the 3 being volley balls?

total balls = 12
Volley balls = 5
3 balls are drawn.
means $\{VVV\} = \frac{5}{12} \times \frac{5}{12} \times \frac{5}{12}$

$P(E) = \frac{125}{1728} = 0.07$

Qno 16

If Fiona prepare her energy drink in morning.

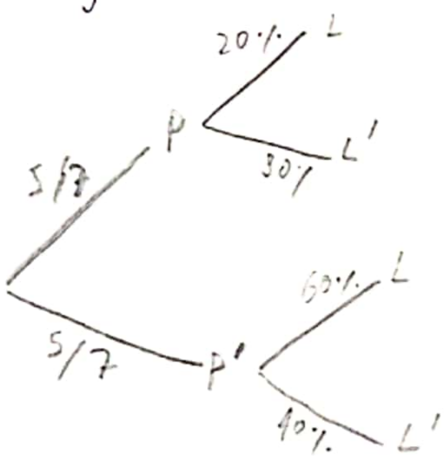
80% probability of being on time for her fitness class

If Fiona does not prepares her energy drink,

60% probability that she is late to her fitness class

She prepares her energy drink every 5 out of 7 days.

a) Probability that she is on time for her fitness class.



$P(L')$

$$= \frac{5}{7} \times \frac{8}{100} + \left(\frac{2}{7}\right)\left(\frac{40}{100}\right)$$

$$= \frac{24}{35}$$

$$= \frac{24}{35} \Rightarrow 0.685 \quad \underline{\text{Ans}}$$

6) If she tries to go to her fitness class ~~150~~ 150 times a year, how many times is she on time?

The probability of her being on time or not late is $\frac{24}{35}$

We will multiply it by her's class times i.e 150

$$= \frac{24}{35} \times 150$$

$$= 102.85$$ Ans