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Probability

1. Total = 15 marbles

$\Rightarrow {}^{15}C_2 = \frac{15!}{2!(15-2)!} \Rightarrow \frac{15 \times \cancel{14}^{7} \times \cancel{13!}}{2! \, \cancel{13!}} \Rightarrow 105$

at least one green = 1 - prob of no green

non-green = 3+4+2 = 9

$\Rightarrow {}^{9}C_2 = \frac{9 \times \cancel{8}^{4}}{\cancel{2 \times 1}} \Rightarrow 36 \Rightarrow \frac{36}{105} \Rightarrow \frac{12}{35}$

$\Rightarrow 1 - \frac{12}{35} \Rightarrow \frac{35-12}{35} = \frac{23}{35}$

2. Total marbles = 15

${}^{15}C_2 = 105$

blue or yellow = 3+2 = 5

${}^{5}C_2 \Rightarrow \frac{5 \times \cancel{4}^{2}}{\cancel{2 \times 1}} \Rightarrow 10 \Rightarrow \frac{10}{105} = \frac{2}{21}$

3. Total number of marbles = 15

4 marbles $= {}^{15}C_4 = \frac{15 \times 14 \times 13 \times 12 \times 11!}{4!\,(15-4)!}$

$\Rightarrow \frac{15 \times \cancel{14}^{7} \times 13 \times \cancel{12}^{3}}{\cancel{4 \times 3 \times 2}} \Rightarrow 1365$

No. of non-blue = 4+6+2 = 12

$\Rightarrow {}^{12}C_4 \Rightarrow \frac{\cancel{12}^{3} \times 11 \times \cancel{10}^{5} \times 9}{\cancel{4 \times 3 \times 2 \times 1}} \Rightarrow 495$

$\Rightarrow \frac{495 \div 5 \text{ or } 3}{1365 \div 5 \text{ or } 3} \Rightarrow \frac{99}{273} = \frac{33}{91}$

4. A leap yr has 366 days

366 days = 52 weeks and 2 extra

2 extra days can be some p

(S,M) (M,T) (T,W) (W,T) (T,F) (F,

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there are 7 possible combination for 2 extra Sunday, monday) out of 7 possible outcome
$= 1/7$

5. Total books = 10
no. of ways to arrange 9 units = 9!
the two books within the pair can be arranged in 2! ways $\Rightarrow 9! \times 2!$
total no. of ways to arrange 10 books = 10!

$$\Rightarrow \frac{9! \times 2!}{10!} = \frac{\cancel{9!} \times 2!}{10 \times \cancel{9!}} \Rightarrow \frac{2}{10} = 1/5$$

6. two consecutive integers is always are $n, n+1$
Sum is $n + (n+1) = 2n+1$
$2n$ is even, $2n+1$ is odd
$\therefore$ Sum of two integers is always o
the probability is 1

7. Total marbles = 15

$$15_{C_3} = \frac{\cancel{15}^{5} \times \cancel{14}^{7} \times 13}{\cancel{3} \times \cancel{2}} = 455$$

red marbles = 4
1 yellow marble from 2 $= 2_{C_1} = 2$
2 red marbles from 4 $= 4_{C_2} = \frac{\cancel{4}^{2} \times 3}{\cancel{2}} =$
1 yellow & 2 red $= 2_{C_1} \times 4_{C_2} = 2 \times 6 = 12$

$$\Rightarrow \frac{2_{C_1} \times 4_{C_2}}{15_{C_3}} \Rightarrow \frac{12}{455}$$

8. Total persons = 10
no. of graduates = 4
non-graduates = $10 - 4 \Rightarrow 6$

$$10_{C_3} = \frac{10 \times \cancel{9}^{3} \times \cancel{8}^{4}}{\cancel{3} \times \cancel{2}} = 120$$

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$\Rightarrow {}^6C_3 = \frac{6 \times 5 \times 4}{3 \times 2 \times 1} \Rightarrow 20$ $\Rightarrow \frac{20}{120} = 1/6$

probability of least one $= 1 - 1/6 \Rightarrow 5/6$

9. Total no. of couples = 5
no. of people choosen = 5
$\Rightarrow {}^{10}C_5 \Rightarrow \frac{10 \times 9 \times 8 \times 7 \times 6}{5 \times 4 \times 3 \times 2 \times 1} \Rightarrow 252$

$\Rightarrow$ 2 couples ${}^5C_2 = 10$ ways

10. $p = 0.2$
ticket not being a prized $1 - p = 1 - 0.2$
$= 0.8$

$\therefore$ probability of no prize on 4 tickets
$= 0.8 \times 0.8 \times 0.8 \times 0.8 = (0.8)^4$
$= 0.4096$

probability of winning at least one ticket $= 1 - 0.4096 \Rightarrow 0.5904$

11. Box 1: 39 red balls
Box 2: 26 green balls
Box 1 = 1/2
Box 2 = 1/2
Total probability of red ball = P(Box1) × P(
+ P(Box2) × P(

$= 1/2 \times \frac{R_1}{N_1} + \frac{1}{2} \times \frac{R_2}{N_2}$

$\frac{R_1}{N_1}$ and $\frac{R_2}{N_2}$

we have 39 red balls & 26 green balls
placing one red ball in box 1
so, $R_1 = 1$, $N_1 = 1$
$(39 - 1) = 38$.

So, Box 2 = $R_2 = 38$, $N_2 = 38+26 = 64$

$P(\text{red}) = \frac{1}{2} \times \frac{1}{1} + \frac{1}{2} \times \frac{38}{64} \Rightarrow \frac{51}{64}$

12. Total no. of balls = 6+8+7 = 21 balls

prob of red ball = p = 6/21 = 2/7

not a red ball = q = 1 − 2/7 = 5/7

no. of trials = n = 5

binomial prob = $P(X=k) = C(n,k)\, p^k q^{n-k}$

if $P(X=3) = {}^5C_3 = 10 \Rightarrow 10 \times \left(\frac{2}{7}\right)^3 \times \left(\frac{5}{7}\right)^2 = \frac{2000}{16807}$

if $P(X=4) = {}^5C_4 = 5 \Rightarrow \frac{400}{16807}$

if $P(X=5) = {}^5C_5 = 1 = \frac{32}{16807} = \frac{2432}{16807}$