Probability :-

Q1. A box contains
3 → Blue marbles
4 → Red marbles
6 → Green marbles
2 → yellow marbles.

$$\frac{{}^{6}C_{2}}{{}^{15}C_{2}} * \frac{{}^{3}C_{1} * {}^{6}C_{1}}{{}^{15}C_{2}} + \frac{{}^{4}C_{1} * {}^{6}C_{1}}{{}^{15}C_{2}} + \frac{{}^{2}C_{1} * {}^{6}C_{1}}{{}^{15}C_{2}}$$

$$\frac{15 + 18 + 24 + 12}{105} = \frac{69}{105} = \frac{23}{35}$$

$$= \frac{15}{105_{35}}$$

$\frac{15 \times 14}{210} = \frac{105}{2}$

probability that at least one is green
$= \frac{23}{35}$

Q2. A box contains
3 → Blue
4 → Red
6 → Green
2 → yellow marbles

$$\frac{{}^{3}C_{2}}{{}^{15}C_{2}} + \frac{{}^{3}C_{1} \times {}^{2}C_{1}}{{}^{15}C_{2}} + \frac{{}^{2}C_{2}}{{}^{15}C_{2}}$$

${}^{3}C_{2} = 3$, ${}^{3}C_{1} \times {}^{2}C_{1} = 6$
${}^{15}C_{2} = 105$
${}^{2}C_{2} = 1$

$$\frac{3 + 1 + 6}{105}$$

$$= \frac{10^{2}}{105_{21}} = \frac{2}{21}$$

probability of either blue or yellow $= \frac{2}{21}$

Q3. A box contains
3 → blue
4 → Red
6 → Green
2 → yellow
} Probability that none is blue?

⇒ none is blue then it should be Red, Green or Yellow.
4 + 6 + 2 = 12.
Total marbles = 15

$$= \frac{{}^{12}C_4}{{}^{15}C_4} = \frac{\frac{12!}{4!(12-4)!}}{\frac{15!}{4!(15-4)!}}$$

$$P = \frac{495}{1365} = \frac{33}{91}.$$

probability that none is blue $= \frac{33}{91}$.

Q4. 10 books are placed at random on a shelf. The probability that pair of books will always be together is?

⇒ pair of books will always be together.
∴ 2 books will be together
↳ So it would be treated as a single book.
∴ 9! ways.
And 2 books will be together 2!
Total number of books 10.

$$P(G) = \frac{n(E)}{n(S)} = \frac{9! \times 2!}{10!} = \frac{9! \times 2}{10!}$$

$$= \frac{2}{10} = \frac{1}{5}.$$

Q5. What is the probability that a leap year has 53 Sundays and 53 Mondays?

⇒ Leap year → 366 days.

52 weeks + 2 days

There two days can be,

(Sun, Mon) (Mon, Tue) (Tue, Wed) (Wed, Thu) (Thu, Fri)
(Sat, Sun) (Fri, Sat)

(Sun, Mon) ✓ → 53 Sundays, 53 Mondays

$= \frac{1}{7}$

Q6. Out of 20 consecutive integers, two are chosen at random. The probability that their sum is odd is?

⇒ In consecutive integers,

num of even = num of odd

10 even + 10 odd.

$\frac{{}^{10}C_1 \times {}^{10}C_1}{{}^{20}C_2}$

$\frac{10\phi}{19\phi} = \frac{10}{19}$

∴ probability $= \frac{10}{19}$

Q7. 3 → blue
4 → red
6 → Green
2 → yellow. , three marbles drawn, prob of 1 is yellow + 2 are red

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$\Rightarrow \frac{^2C_1 \times ^4C_2}{^{15}C_3}$

$\frac{4\times3}{1\times2} = \frac{12}{2_1} = 6$

$\frac{2\times6}{105} = \frac{12}{105} = \frac{4}{35}$

$\frac{15\times14}{1\times2\times3_1} = \frac{210}{6_1} = 35$

$= \frac{4}{35} \quad \frac{12}{455}$

Q8. 10 → persons working on project.
4 → Graduate
3 are selected
probability at least 1 graduate among them.

$\Rightarrow \frac{^4C_1 \times ^6C_3}{^{10}C_3} + \frac{^4C_2 \times ^6C_1}{^{10}C_3} + \frac{^4C_3}{^{10}C_3}$

$\frac{4\times3}{6} = \frac{12}{6_1} = 2$

$\frac{4\times20 + 6\times6 + 4}{120}$

$\frac{10\times9}{1\times2\times3} = 15 \quad \frac{6\times5}{1\times2\times3} = 20$

$\frac{4\times3}{1\times2} = \frac{12}{2_1} = 6 \quad \frac{96}{63_1} = 5$

$\frac{20+36+2}{120} = \frac{58}{120} = \frac{5}{6}$

Q9. In a party there are 5 couple.
5 people choosen random
probability of at least 2 couples

=) 5 couples → 10 people
$^5C_2 \times ^6C_1$ → 2 couples and 1 person

$\frac{^5C_2 \times ^6C_1}{^{10}C_5} = \frac{10\times6}{252} = \frac{5}{21}$

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Q10. probability of lottery ticket being a prized ticket 0.2 .... 4 tickets purchased. probability of winning a prize on at least one ticket is?

=) probability of prized ticket = 0.2
probability of losing = 1 - p(win)
= 1 - 0.2
= 0.8.

∴ p(lose) = 0.8

On 4 tickets = $(0.8)^4 = 0.4096$

p(at least one win) = 1 − p(lose in 4 tickets)
= 1 − 0.4096
∴ p(at least one win) = 0.5904.

Q11. Two boxes, one containing 39 → red balls & other containing 26 → Green balls. You are allowed to move the balls b/w the boxes so that when u choose box at random & a ball at random from the choosen box the probability of getting red ball maximized, This maximum probability is

=) 1st box → 1 red ball
2nd box → 38 red balls & 26 green balls
(Total 64 balls)

p(first box) = 1/2
p(red ball from 1st box) = 1/2 * 1/1 = 1/2

p(second box) = 1/2
p(red ball from 2nd box) = $\frac{1}{2} * \frac{38}{64} = \frac{19}{64}$

$P(\text{picking red ball}) = \frac{1}{2} * 1 + \frac{1}{2} * \frac{38}{64}$

$= \frac{1}{2} + \frac{19}{64} = \frac{32}{64} + \frac{19}{64} = \frac{51}{64}$

$P = \frac{51}{64}$

Q12. 6 → Red ball
8 → Blue ball
7 → Green ball
5 → drawn with Replacement
$P(\text{three are red}) = ?$

$^{15}C_2$

20349 20349 .2907

$$\frac{{}^{15}C_2 \times {}^{6}C_3}{{}^{21}C_5} + \frac{{}^{15}C_1 \times {}^{6}C_4}{{}^{21}C_5} + \frac{{}^{6}C_5}{{}^{21}C_5}$$

$$= \frac{105 \times 20 + 15 \times 15 + 6}{20349}$$

$$= \frac{2100 + 225 + 6}{20349}$$

37 259 777

$$= \frac{2331}{20349} = \frac{37}{323}$$

6783

2261 323