
PROBABILITY

- KOUSTAV

CONCEPT

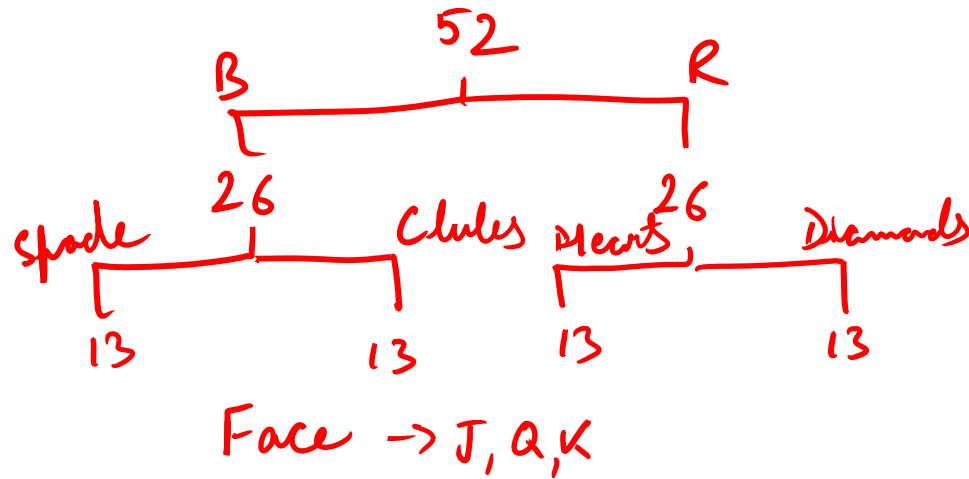
$$P = \frac{F}{T}$$

I. A card is drawn from a well-shuffled pack of cards. What is the probability of getting a spade?

Ans: _____

$$P = \frac{13}{52} = \frac{1}{4}$$

$$P = \frac{{}^{13}C_1}{{}^{52}C_1} = \frac{13}{52} = \frac{1}{4}$$



2. A card is drawn from a well-shuffled pack of cards. What is the probability of getting a spade or a diamond?

Ans: _____

$$\begin{aligned} P &= P(s) \text{ or } P(D) \\ &= \frac{13}{52} + \frac{13}{52} = \frac{26}{52} = \frac{1}{2} \end{aligned}$$

$$P = \frac{{}^{13}C_1 + {}^{13}C_1}{{}^{52}C_1} = \frac{13+13}{52} = \frac{26}{52} = \frac{1}{2}$$

3. Two cards are drawn from a well-shuffled pack of cards. What is the probability that the first is a spade and the second is a diamond?

Ans: _____

$$P = P(S, D) = \frac{13}{52} \times \frac{13}{51} = \frac{1}{4} \times \frac{13}{51} = \frac{13}{204}$$

$$P = \frac{{}^{13}C_1 \times {}^{13}C_1}{{}^{52}P_2} = \frac{13 \times 13}{52 \times 51} = \frac{13}{204}$$

4. Two cards are drawn from a well-shuffled pack of cards. What is the probability of getting a spade and a diamond?

Ans: _____

$$P = P(S, D) \text{ or } P(D, S) \quad \checkmark$$
$$= \frac{13}{52} \times \frac{13}{51} + \frac{13}{52} \times \frac{13}{51} = 2 \times \frac{1}{4} \times \frac{13}{51} = \frac{13}{102} //$$

$$P = \frac{{}^{13}C_1 \times {}^{13}C_1}{{}^{52}C_2} = \frac{13 \times 13}{\frac{52 \times 51}{2}} = \frac{1}{4} \times \frac{13}{51} \times 2 = \frac{13}{102} //$$

5. Two bottles are randomly selected from a stack of 10 bottles in which 5 are blue, 3 are green, and 2 are yellow. What is the probability that the 1st bottle selected is blue and the 2nd is green?

Ans: _____

$$P = \frac{5}{10} \times \frac{3}{9} = \frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$$

$$P = \frac{{}^5C_1 \times {}^3C_1}{{}^{10}P_2} = \frac{5 \times 3}{10 \times 9} = \frac{1}{6}$$

6. Three bottles are randomly selected from a stack of 12 bottles in which 3 are black, 4 are white, and 5 are red. What is the probability that all 3 bottles selected are of different colour?

Ans: _____

$$P = \frac{{}^3C_1 \times {}^4C_1 \times {}^5C_1}{{}^{12}C_3} = \frac{3 \times 4 \times 5}{\frac{12 \times 11 \times 10}{3 \times 2}} = \frac{3}{11}$$

7. Two dice are rolled. What is the probability that the sum of the results is 5?

Ans: _____

$$T = \underline{6} \times \underline{6} = 36$$

F =

D ₁	D ₂
1	4
2	3
3	2
4	1
5	x
6	x

} 4

$$P = \frac{4}{36} \times \frac{1}{9}$$

8. Two dice are rolled. What is the probability that the sum of the results is less than or equal to 5?

Ans: _____

$$T = 36$$

F =

D_1	D_2
1	1, 2, 3, 4
2	1, 2, 3
3	1, 2
4	1
5	x
6	x

} 10

$$P = \frac{10}{36} = \frac{5}{18}$$

9. A fair coin is tossed 6 times. What is the probability that heads turns up exactly 2 times?

Ans: _____

$$T = \underline{2} \quad \underline{2} \quad \underline{2} \quad \underline{2} \quad \underline{2} \quad \underline{2} = 2^6 = 64$$

$$F = \overbrace{H, H}, \overbrace{T, T, T, T} \rightarrow \frac{6!}{2! \times 4!} = \frac{6 \times 5}{2} = 15$$

$$P = \frac{15}{64}$$

	H	T
Fair	$\frac{1}{2} = 50\%$	$\frac{1}{2} = 50\%$
Unfair	$\frac{1}{4} = 25\%$ 10%	$\frac{3}{4} = 75\%$ 90%

10. A bag contains three differently coloured bottles, which include 3 black, 4 white, and 5 red. If 3 bottles are picked randomly from the bag, what is the probability that:

i. All the three are black? Ans: _____

ii. None of them are white? Ans: _____

iii. All of them are not white? Ans: _____

$$i) P = \frac{3}{12} \times \frac{2}{11} \times \frac{1}{10} = \frac{1}{220} \quad \Bigg| \quad P = \frac{{}^3C_3}{{}^{12}C_3} = \frac{1}{\frac{12 \times 11 \times 10}{3 \times 2}} = \frac{1}{220}$$

$$ii) P = \frac{{}^8C_3}{{}^{12}C_3} = \frac{\frac{8 \times 7 \times 6}{3 \times 2}}{\frac{2 \times 12 \times 11 \times 10}{3 \times 2}} = \frac{14}{55}$$

$$iii) P(\text{All white}) = \frac{{}^4C_3}{{}^{12}C_3} = \frac{4}{220} = \frac{1}{55}$$

$$P(\text{All NOT white}) = 1 - \frac{1}{55} = \frac{54}{55}$$

11. A committee of 10 people needs to be seated on 10 chairs in a straight line. What is the probability that 3 particular people always sit together?

Ans: _____

$$T = 10!$$

$$F = \begin{array}{cccccccccc} 1 & 2 & 3 & 4 & 5 & 6 & 7 & \boxed{8} & 9 & 10 \\ | & | & | & | & | & | & | & | & | & | \end{array}$$

$$8! \times 3!$$

$$P = \frac{8! \times 3!}{10!} = \frac{3 \times 2}{10 \times 9} = \frac{1}{15}$$

12. The probability of getting heads in both trials when a balanced coin is tossed twice will be?

- ☒ A. $1/4$ B. $1/2$ C. 1 D. $3/4$

Handwritten list of outcomes for two coin tosses:

H	H
H	T
T	H
T	T

Handwritten probability $1/4$ circled in red.

13. A card is drawn from a well-shuffled pack of cards. The probability of getting a queen of club or king of the heart is?

A. 1/52

B. 1/26

C. 1/13

D. None of these

$$P = \frac{1+1}{52} = \frac{2}{52} = \frac{1}{26}$$

14. If the probability that A will live 15 years is $\frac{7}{8}$ and that B will live 15 years is $\frac{9}{10}$, then what is the probability that both will live 15 years?

A. $\frac{1}{20}$

B. $\frac{63}{80}$

C. $\frac{1}{5}$

D. None of these

$$P = P(A^{\checkmark}, B^{\checkmark}) = \frac{7}{8} \times \frac{9}{10} = \frac{63}{80}$$

NONE

$$P = P(A^{\times}, B^{\times}) = \frac{1}{8} \times \frac{1}{10} = \frac{1}{80}$$

Only One Alive

$$\begin{aligned} P &= P(A^{\checkmark}, B^{\times}) \text{ or } P(A^{\times}, B^{\checkmark}) \\ &= \frac{7}{8} \times \frac{1}{10} + \frac{1}{8} \times \frac{9}{10} = \frac{7}{80} + \frac{9}{80} = \frac{16}{80} \end{aligned}$$

→ Not Both Alive
→ At most 1 alive

$$= 1 - \frac{63}{80} = \frac{17}{80}$$

15. The probability of drawing a red card from a deck of playing cards is

A. 2/18

B. 1/13

C. 1/4

D. 1/2

$$\frac{26}{52} = \frac{1}{2}$$

16. Two dice are rolled. What is the probability that the sum of the numbers appeared on them is 8 or 11?

A. $1/6$

B. $1/18$

C. $1/9$

✓ D. $7/36$

$$T = 36$$

F =

D_1	D_2
1	X
2	6
3	5
4	4
5	3, 6
6	2, 5

} 7

$$P = \frac{7}{36}$$

17. A bag contains 8 red and 5 white balls. 2 balls are drawn at random. What is the probability that both are white?

A. 5/16

B. 2/13

C. 3/26

D. 5/39

$$\frac{5}{13} \times \frac{4}{12} = \frac{5}{39}$$

$$\frac{{}^5C_2}{{}^{13}C_2} = \frac{5}{39}$$

18. Three unbiased coins are tossed. What is the probability of getting at most 2 heads?

A. $1/4$

B. $3/8$

✓ C. $7/8$

D. $1/2$

$$T = \underline{2} \quad \underline{2} \quad \underline{2} = 8$$

H	H	H
H	H	T
H	T	H
H	T	T
T	H	H
T	H	T
T	T	H
T	T	T

$$= \frac{7}{8}$$

19. A brother and sister appear for an interview against two vacant posts in an office. The probability of the brother's selection is $\frac{1}{5}$ th and that of the sister's selections is $\frac{1}{3}$ rd. What is the probability that only one of them is selected?

A. $\frac{1}{5}$

✓ B. $\frac{2}{5}$

C. $\frac{1}{3}$

D. $\frac{2}{3}$

$$P = P(B^{\checkmark}, S^{\times}) \text{ OR } P(B^{\times}, S^{\checkmark})$$

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

NONE

$$P = P(B^{\times}, S^{\times}) = \frac{4}{5} \times \frac{2}{3} = \frac{8}{15}$$

NOT both Selected / At most one selected

$$P = 1 - \frac{1}{15} = \frac{14}{15}$$

All Selected

$$P = P(B^{\checkmark}, S^{\checkmark}) = \frac{1}{5} \times \frac{1}{3} = \frac{1}{15}$$

At least one selected

$$P(B^{\checkmark}, S^{\times}) + P(B^{\times}, S^{\checkmark}) + P(B^{\checkmark}, S^{\checkmark})$$
$$= \frac{6}{15} + \frac{1}{15} = \frac{7}{15}$$

$$\left[1 - \text{None} \right]$$
$$= 1 - \frac{8}{15}$$

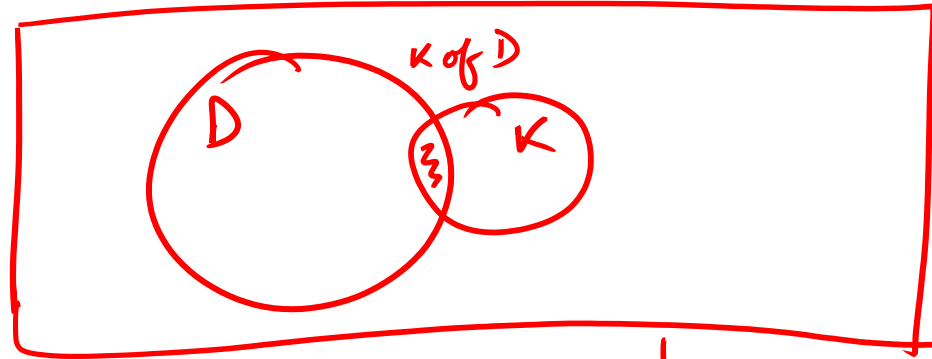
20. The probability that a card drawn from a pack of 52 cards will be a diamond or a king is?

A. 1/13

✓ B. 4/13

C. 1/52

D. 2/13



$$P = P(D) + P(K) - P(K \text{ of } D)$$

$$= \frac{13}{52} + \frac{4}{52} - \frac{1}{52}$$

$$= \frac{16}{52} = \frac{4}{13}$$

$$P = \frac{{}^{13}C_1 + {}^4C_1 - {}^1C_1}{{}^{52}C_1}$$

$$= \frac{13 + 4 - 1}{52}$$

$$= \frac{16}{52} = \frac{4}{13}$$

ANSWER KEY – PROBABILITY

QUESTION	ANSWER	QUESTION	ANSWER
1	1/4	11	1/15
2	1/2	12	A
3	13/204	13	B
4	13/102	14	B
5	1/6	15	D
6	3/11	16	D
7	1/9	17	D
8	5/18	18	C
9	15/64	19	B
10	1/220, 14/55, 54/55	20	B