PROBABILITY

- KOUSTAV

CONCEPT

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

1. 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: _____

$P = P(S) \text{ or } P(D)$

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

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

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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: _____

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

$P = \frac{{}^{13}C_1 \times {}^{13}C_1}{{}^{52}P_2} = \frac{13 \times 13}{52 \times 51} = \frac{1}{4} \times \frac{13}{51} = \frac{13}{204}$

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

Ans: _____

$P = P(S, D) \text{ or } P(D, S)$

$= \frac{13}{52} \times \frac{13}{51} + \frac{13}{52} \times \frac{13}{51} = 2 \times \frac{1}{4} \times \frac{13}{51} = \frac{13}{102}$

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

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: _____

$P = P(B, G) = \frac{5}{10} \times \frac{3}{9} = \frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$

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

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: _____

$T = 6 \times 6 = 36$

$F =$

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

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

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

$T = 6^2 = 36$

$F =$

D_1	D_2	
1	1, 2, 3, 4	10
2	1, 2, 3	
3	1, 2	
4	1	
5	x	
6	x	

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

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

$T = 2\ 2\ 2\ 2\ 2\ 2 = 2^6 = 64$

$F = \overset{\frown}{HH}TTTT = \frac{6!}{2! \times 4!} = \frac{6 \times 5}{2} = 15$

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

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

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

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

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

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: _____

$T = 10!$

$F = 1\ 2\ 3\ 4\ 5\ 6\ 7\ \boxed{8\ 9\ 10} \Rightarrow 8! \times 3!$

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

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

$\boxed{H\ H}$
$H\ T$
$T\ H$
$T\ T$

$\frac{1}{4}$

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

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

14. If the probability that A will live 15 years is 7/8 and that B will live 15 years is 9/10, then what is the probability that both will live 15 years?
A. 1/20 B. 63/80 C. 1/5 D. None of these

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

$P = P(A^{\times}, B^{\times}) = \frac{1}{8} \times \frac{1}{10} = \frac{1}{80}$
(None alive)

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

Both NOT 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

$T = 6^2 = 36$

$F =$

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

$2^3 = 8$

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 1/5th and that of the sister's selections is 1/3rd. What is the probability that only one of them is selected?

A. 1/5 B. 2/5 C. 1/3 D. 2/3

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

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

$= \frac{2}{15} + \frac{4}{15} = \frac{6}{15} = \frac{2}{5} = \frac{6}{15}$

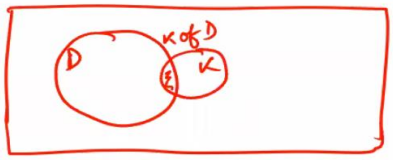
Both Selected $= \frac{1}{5} \times \frac{1}{3} = \frac{1}{15}$

Both NOT Selected $= 1 - \frac{1}{15} = \frac{14}{15}$

None selected $= \frac{4}{5} \times \frac{2}{3} = \frac{8}{15}$

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



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

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

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