Puzzles on Probability, Conditional Probability and Bayes' Theorem

1. Define probability and explain classical definition with an example.

2. Two coins are tossed simultaneously. Find the probability of getting at least one head.

3. A card is drawn from a standard deck of 52 cards. Find the probability that it is a red king.

4. Define mutually exclusive and independent events with examples.

5. A die is thrown. Find the probability of getting a number divisible by 2 or 3.

6. From a bag containing 5 red and 3 blue balls, one ball is drawn at random. Find the probability that it is red.

7. Two events A and B are such that $P(A) = 0.6$, $P(B) = 0.5$ and $P(A \cap B) = 0.3$. Find $P(A \cup B)$.

8. If $P(A) = 0.4$, $P(B) = 0.5$ and A and B are independent, find $P(A \cap B)$.

9. A student answers a multiple-choice question by guessing. If there are 4 options, what is the probability of choosing the correct answer?

10. Define conditional probability. If $P(A) = 0.5$, $P(B) = 0.4$ and $P(A \cap B) = 0.2$, find $P(A|B)$.

11. A box contains 4 defective and 6 non-defective items. If one item is selected, find probability that it is defective.

12. A card is drawn and replaced, then another card is drawn. Find probability of getting two aces.

13. In a class, 60% are boys and 40% are girls. 30% of boys and 20% of girls wear spectacles. Find probability that a randomly chosen student wears spectacles.

14. State Bayes' Theorem.

15. Three machines A, B, C produce 30%, 45%, and 25% of total output respectively. Their defect rates are 2%, 3%, and 5% respectively. If a product is found defective, find probability that it was produced by machine C (use Bayes' theorem).

16. Two events A and B are mutually exclusive with $P(A) = 0.3$ and $P(B) = 0.4$. Find $P(A \cup B)$.

17. If $P(A|B) = 0.6$ and $P(B) = 0.5$, find $P(A \cap B)$.

18. A family has two children. What is probability that both are boys given that at least one is a boy?

19. A test for a disease is 95% accurate. If 2% of population has disease, find probability that a person actually has disease given test is positive (Bayes' theorem).

20. A pair of dice is thrown. Find probability that sum is 8 given that first die shows 3.