1. There are three boxes, each containing 12 marbles. Two of them contain an equal number of red, blue and green marbles (i.e. 4 of each), one contains only red and blue marbles (6 of each). One box is selected at random and four marbles are drawn from it. Obtaining two red and two blue marbles, what is the conditional probability of having selected the box with no green marbles?

2. Consider a square table with two chairs at each side. If three friends and five other people are randomly seated around this table (two people at each side), what is the probability that any two of our three friends will sit next to each other (at the same side of the table), and the third friend will be facing them (sitting at the opposite side)?

3. Consider rolling a die followed by flipping a coin as many times as the number of heads shown. Given that this results in more than 2 heads, what is the conditional probability that the die showed fewer than 5 dots?

4. A die is rolled three times. What is the probability that the three numbers obtained increase in size (i.e. second bigger than first, third bigger than second)?

5. Find the coefficient of x^3 in the following expression (when fully expanded):
$$(2 - 3x + 4x^2 - 5x^3)^7$$

6. Jim, Joe, Tom and 4 other boys are randomly seated in a row. What is the probability that Jim will be sitting between Joe and Tom, next to Joe but not necessarily next to Tom.

7. 20% of all soldiers in the army are left-handed. Since a rifle is easier to handle by a right-handed soldier, the probability that a left-handed soldier misses a target is 30%, while for a right-handed soldier the same probability equals to 25%. A randomly selected soldier fired 3 shots and missed each time. What is the probability that he is left-handed?

8. Five men and three women are randomly seated at a round table. What is the probability that no two women sit next to each other?

9. Consider two decks of cards, one is complete (with 52 cards), the other has 3 of its 4 aces removed (thus containing 49 cards only). One of these two decks is randomly selected and shuffled. If 13 cards are dealt from this deck and none of them is an ace, what is the conditional probability of having selected the complete deck?

10. Find the coefficient of x^{10} in the McLaurin expansion of the following function:
$$\frac{(1+x)^2}{(1-x^2)^{17}}$$

11. If we flip 3 coins, then roll a die as many times as the number of heads obtained (possibly none), what is the probability of getting exactly one six and no fives.

12. Tom, Dick, Harry and 4 other people are randomly seated at a round table. Find the probability that Dick will neither sit beside Harry, nor (immediately) at Tom's left.

13. Frank, Tom, Jim and 5 other boys are randomly seated in a row. What is the probability that neither Frank nor Tom will sit next to Jim?

14. There are 2 red and 5 blue marbles in a box. One is randomly selected, then returned to the box together with 3 extra marbles of the same color. This is repeated two more times (until the number of marbles in the box is 16).

    (a) What is the probability that 8 of these 16 marbles are red?

    (b) Given that the last marble drawn was blue, what is the probability that the first one was red?

15. A deck of cards is thoroughly shuffled. What is the probability that the ace of hearts will end up 'sandwiched' between a spade and a club.

16. A box contains 4 red and 2 blue marbles. A marble is selected at random, then returned to the box together with 3 extra marbles of the same color. Finally, two more marbles are selected at random. If they are both blue, what is the probability that there are no more blue marbles left in the box?

17. Three friends and 17 other boys are randomly divided into four teams of 5. What is the probability that at least two of the three friends will play for the same team?

18. Two couples and 6 other people are randomly seated at a round table. What is the probability that Mr. and Mrs. A will sit next to each other and (at the same time) Mr. and Mrs. B will sit apart?

19. Three friends and 6 other boys are randomly seated in a row. What is the probability that at least two of the three friends will sit next to each other?

20. Consider two dice, one regular, the other crooked (having two faces with 6 dots)! Both dice are rolled, exactly one of them shows six. What is the (conditional) probability that this (the one showing a six) is the crooked die?

21. In a fully expanded
$$(4 - x + 3y - 2xy)^7$$
what is the coefficient of x^2y^3?

22. Two couples and 6 other people are randomly seated at a round table. What is the probability that Mr. and Mrs. A will sit directly opposite each other and (at the same time) Mr. and Mrs. B will sit apart from each other

23. If Jim rolls one die and Joe rolls two dice, what is the probability that Jim gets more dots than Joe?

24. Three couples are randomly seated at a round table. What is the probability that none of the couples sit next to each other?

25. A, B and C are mutually independent, having the probability of 0.25, 0.35 and 0.45 respectively. Find

    (a)
$$\Pr\left[(A \cap \overline{B}) \cup C\right]$$

(b)

$$\Pr\left[(A \cup \overline{B}) \cap C\right]$$

26. Three cards are dealt from a deck of 52. Then, for each space in this hand, one more card is dealt (for a total of 6). What is the probability of getting exactly two spades in total?