Topic: Probability 1 and 2 in Book 2   (Topics 77 to 85)

Q1. How many ways can the letters of the word IRELAND be arranged if each letter is used exactly once in each arrangement? In how many of these arrangements do the three vowels come together? **Ans:** 5040, 720	**Q2.** How many arrangements of the word DUBLIN begin with the letter D? **Ans:** 120
	Q3. A team of 4 is to be selected from a squad of 10. How many teams are possible? **Ans:** 210
Q4. How many 5 digit numbers can be made from the digits 3, 4, 5, 6 and 7, if no digit may appear more than once in each number? How many of these numbers are even? How many are greater than 50,000? **Ans:** 120, 48, 72	**Q5.** How many ways can the letters of the word DENMARK be arranged if the letters A and E must not be side by side? **Ans:** 3600
Q6. There are 6 people in a room. If everyone shakes hands with everyone else how many handshakes take place? **Ans:** 15	**Q7.** Given 7 different points on a plane, no three of which are collinear, how many different triangles can be drawn? **Ans:** 35
Q8. A bag contains 10 discs, 6 red and 4 black. Two discs are removed from the bag. Find the probability that they are: (i) both red (ii) the same colour (iii) different colours **Ans:** (i) $\frac{1}{3}$ (ii) $\frac{7}{15}$ (iii) $\frac{8}{15}$	**Q9.** A team of 5 is to be chosen from 8 men and 7 women. (i) How many teams can be chosen that contain exactly three men? (ii) How many teams contain more men than women? **Ans:** 1176, 1722
Q10. There are 30 days in June. Seven students have their birthdays in June. The birthdays are independent of each other and all dates are equally likely. (i) What's the probability that all 7 students have the same birthday? (ii) What's the probability that all 7 have different birthdays? (iii) Show that the probability that at least 2 have the same birthday is greater than 0.5. **Ans:** (i) $\frac{1}{729,000,000}$ (ii) 0.47	**Q11.** A box contains 4 silver coins, 2 gold coins and x copper coins. Two coins are picked at random, and without replacement, from the box. (i) Write down an expression in x for the probability that the two coins are copper. (i) If it's known that the probability of picking two copper coins is $\frac{4}{13}$, how many copper coins are in the box? (iii) What is the probability that one of the 2 coins picked is copper? **Ans:** (i) $\frac{x^2 - x}{x^2 + 11x + 30}$ (ii) 8 (iii) $\frac{48}{91}$
Q12. There are 16 discs in a board game: 5 blue, 3 green, 6 red and 2 yellow. Four discs are chosen at random. What is the probability that: (i) the 4 discs are blue? (ii) the 4 discs are the same colour? (iii) all 4 discs are different in colour? (iv) 2 of the discs are blue and 2 are not blue? **Ans:** (i) $\frac{1}{364}$ (ii) $\frac{1}{91}$ (iii) $\frac{9}{91}$ (iv) $\frac{55}{182}$	**Q13.** At the Olympic Games, 8 lanes are marked on the running track. Each runner is allocated to a different lane. Find the number of ways in which the runners in a heat can be allocated to these lanes when there are (i) 8 runners in the heat (ii) 5 runners in the heat and any 5 lanes may be used. **Ans:** (i) 40,320 (ii) 6720
Q14. A subcommittee of 5 is to be chosen from a committee of 10. If one particular person is to serve on both committees, in how many ways can the subcommittee be chosen? **Ans:** 126	**Q15.** The results of a survey are normally distributed with a mean of 65 and a standard deviation of 12. If a person is selected at random, what's the probability that he had a score between 53 and 83? **Ans:** 0.7745

Q16. For a lottery, 35 cards numbered 1 to 35 are placed in a drum. Five cards will be chosen at random from the drum as the winning combination. (i) How many combinations will match exactly 4? (ii) How many combinations will match exactly 3? (iii) Show that the probability of matching at least three numbers is approximately 0.014. **Ans:** (i) 150 (ii) 4350	**Q17.** A classroom contains 15 desks, which are arranged in rows. The front row contains 3 desks. 15 students are seated at random in the classroom, 8 of whom are boys and 7 of whom are girls. Each desk seats only one student. What is the probability that: (i) 3 girls occupy the front row? (ii) there are more boys than girls in the front row? (iii) there are 2 girls and 1 boy in the front row with the 2 girls seated next to each other? **Ans:** (i) $\frac{1}{13}$ (ii) $\frac{36}{55}$ (iii) $\frac{16}{65}$
Q18. In a game of chess against a particular opponent, the probability that Sean wins is $\frac{3}{5}$. He plays 6 games against the opponent. What's the probability that Sean will: (i) lose the 2nd game and 4th games and win the rest? (ii) win exactly 4 games? (iii) lose at least 4 games? **Ans:** (i) 0.021 (ii) 0.311 (iii) 0.1792	**Q19.** The probability of passing a driving test is $\frac{2}{3}$. Six students take the test. Find the probability that: (i) none of them pass (ii) half of them pass **Ans:** (i) $\frac{1}{729}$ (ii) $\frac{160}{729}$
	Q20. A and B are two independent events such that P(A) = 0.2 and P(B) = 0.15. Evaluate the following probabilities: (i) $P(A \cap B)$ (ii) P(A|B) (iii) $P(A \cup B)$ **Ans:** (i) 0.03 (ii) 0.2 (iii) 0.32
Q21. z is a random variable with standard normal distribution. Find (i) P($z \leq 1.32$) (ii) P($z > -0.4$) (iii) P($1.3 \leq z \leq 2$) (iv) P(-0.67$\leq z \leq 1.5$) **Ans:** (i) 0.9066 (ii) 0.6554 (iii) 0.074 (iv) 0.6818	**Q22.** The events A and B are such that P(A) = 0.45, P(B) = 0.35 and P($A \cup B$) = 0.7. Find (i) P($A \cap B$) (ii) Explain why the events A and B are independent. (iii) Find the value of P(A|B). **Ans:** (i) 0.1 (ii) 0.286
Q23. E and F are events such that P(E|F) = $\frac{1}{2}$, P(F|E) = $\frac{1}{3}$ and P($E \cap F$) = $\frac{1}{7}$. Find P($E \cup F$). **Ans:** $\frac{4}{7}$	**Q24.** Given that P(A) = 0.8, P(B) = 0.7 and P(A|B) = 0.8. (i) Find P($A \cap B$) (ii) Show that A and B are independent. **Ans:** (i) 0.56
Q25. Two events A and B are such that P(A) = $\frac{8}{15}$, P(B) = $\frac{1}{3}$, P(A|B) = $\frac{1}{5}$. Calculate the probability that (i) both events occur (ii) only one of the two events occurs (iii) neither event occurs. **Ans:** (i) $\frac{1}{15}$ (ii) $\frac{11}{15}$ (iii) $\frac{3}{15}$	**Q26.** A friend of yours offers you a bet: you have to bet €5. Then you pick a card from a pack. If you choose a Picture Card, you win €20 and if you pick an Ace, you win €50. Is this a good bet? Justify your answer with reference to the expected value. **Ans:** Good bet as can expect to win €3.47 on average each game.