

DISCRETE MATHS (Q 6 & 7, PAPER 2)

LESSON NO. 5: HARD PROBABILITY

2006

- 6 (c) There are thirty 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 is the probability that all seven students have the same birthday?
 - (ii) What is the probability that all seven students have different birthdays?
 - (iii) Show that the probability that at least two have the same birthday is greater than 0.5?

2006

- 7 (b) 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 different combinations are possible?
 - (ii) How many of all the possible combinations will match exactly three numbers with the winning combination?
 - (iii) How many of all the possible combinations will match exactly three numbers with the winning combination?
 - (iv) Show that the probability of matching at least three numbers with the winning combination is approximately 0.014.

2005

- 6 (c) Nine cards are numbered from 1 to 9. Three cards are drawn at random from the nine cards.
- (i) Find the probability that the card numbered 8 is not drawn.
 - (ii) Find the probability that all three cards drawn have odd numbers.
 - (iii) Find the probability that the sum of the numbers on the cards drawn is greater than the sum of the numbers on the cards not drawn.

2005

7 (b) There are sixteen discs in a board-game: five blue, three green, six red and two yellow. Four discs are chosen at random. What is the probability that

- (i) the four discs are blue
- (ii) the four discs are the same colour
- (iii) all four discs are different in colour
- (iv) two of the discs are blue and two are not blue?

2004

6 (c) Eight cards are numbered 1 to 8. The cards numbered 1 and 2 are red, the cards numbered 3 and 4 are blue, the cards numbered 5 and 6 are yellow and the cards numbered 7 and 8 are black.

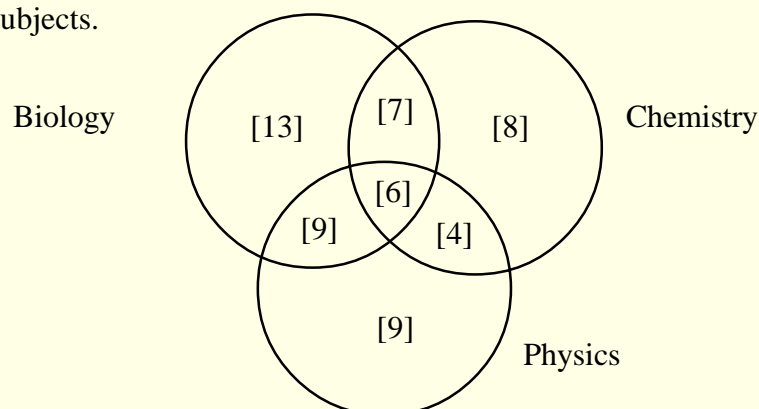
Four cards are selected at random from the eight cards.

Find the probability that the four cards selected are:

- (i) all of different colours
- (ii) two odd-numbered cards and two even-numbered cards
- (iii) all of different colours, two odd-numbered and two even-numbered.

2004

7 (b) In a class of 56 students, each studies at least one of the subjects Biology, Chemistry, Physics. The Venn diagram shows the number of students studying the various combinations of subjects.



- (i) A student is picked at random from the whole class. Find the probability that the student does not study Biology.
- (ii) A student is picked at random from those who study at least two of the subjects. Find the probability that the student does not study Biology.
- (iii) Two students are picked at random from the whole class. Find the probability that they both study Physics.
- (iv) Two students are picked at random from those who study Chemistry. Find the probability that exactly one of them studies Biology.

2003

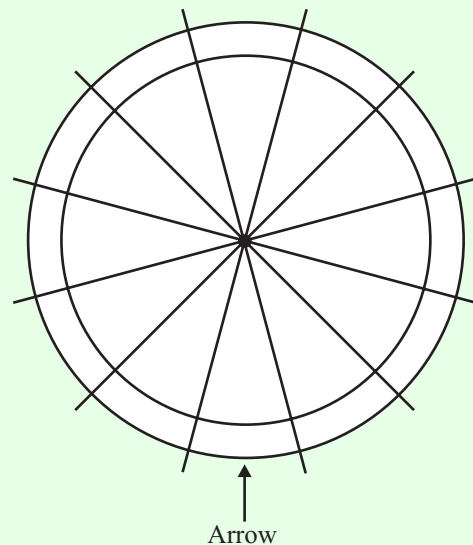
- 6 (c) Ten discs, each marked with a different whole number from 1 to 10, are placed in a box. Three of the discs are drawn at random (without replacement) from the box.
- (i) What is the probability that the disc with the number 7 is drawn?
 - (ii) What is the probability that the three numbers on the discs drawn are odd?
 - (iii) What is the probability that the product of the three numbers on the discs drawn is even?
 - (iv) What is the probability that the smallest number on the discs drawn is 4?

2001

- 6 (c) A box contains four silver coins, two 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.
- If it is known that the probability of picking two copper coins is $\frac{4}{13}$,
- (ii) how many coins are in the box and
 - (iii) what is the probability that neither of the two coins picked is copper?

2001

- 7 (b) To play a game a player spins a wheel. The wheel is fixed to a wall. It spins freely around its centre point. Its rim is divided equally into twelve regions. Three of the regions are coloured red. Four are coloured blue. Five are coloured green. When the wheel stops an arrow fixed to the wall points to one of the regions. All the regions are equally likely to stop at the arrow. The colour of this region is the outcome of the game. When the game is played twice, calculate the probability that



- (i) both outcomes are green
- (ii) both outcomes are the same colour
- (iii) the first outcome is red and the second is green
- (iv) one outcome is green and the other is blue.

ANSWERS

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|---------------------------------------------------|--------------------------|------------------------|-----------------------|
| 2006 6 (c) (i) $\frac{1}{30^6}$ | (ii) $\frac{2639}{5625}$ | | |
| 2006 7 (b) (i) 324,632 | (ii) 150 | (iii) 4,350 | |
| 2005 6 (c) (i) $\frac{2}{3}$ | (ii) $\frac{5}{42}$ | (iii) $\frac{1}{42}$ | |
| 2005 7 (b) (i) $\frac{1}{364}$ | (ii) $\frac{1}{91}$ | (iii) $\frac{9}{91}$ | (iv) $\frac{55}{182}$ |
| 2004 6 (c) (i) $\frac{8}{35}$ | (ii) $\frac{18}{35}$ | (iii) $\frac{3}{35}$ | |
| 2004 7 (b) (i) $\frac{3}{8}$ | (ii) $\frac{2}{13}$ | (iii) $\frac{27}{110}$ | (iv) $\frac{13}{25}$ |
| 2003 6 (c) (i) $\frac{3}{10}$ | (ii) $\frac{1}{12}$ | (iii) $\frac{11}{12}$ | (iv) $\frac{1}{8}$ |
| 2001 6 (c) (i) $\frac{x(x-1)}{(x+6)(x+5)}$ | (ii) 14 | (iii) $\frac{15}{91}$ | |
| 2001 7 (b) (i) $\frac{25}{144}$ | (ii) $\frac{25}{72}$ | (iii) $\frac{5}{48}$ | (iv) $\frac{5}{18}$ |