

Q.1 In a lottery, players win a large prize when they pick four digits that match, in the correct order, four digits selected by a random mechanical process.

A smaller prize is won if **only three digits are matched**.

What is the probability that a player wins the large prize? What is the probability that a player wins the small prize?

Q.2 Find the probability that a hand of five cards in poker contains four cards of one kind.

Q.3 What is the probability that a poker hand contains a full house, that is, three of one kind and two of another kind?

Q.4 What is the probability of three of a kind, that is, three of one kind, two of other kinds.

Q.5 What is the probability that hand of five contains at least one ace.

Q.6 Suppose that we are given 20 tulip bulbs that are similar in appearance and told that 8 will bloom early, 12 will bloom late, 13 will be red, and 7 will be yellow, in accordance with the various combinations listed in Table below:

	Early (E)	Late (L)	Totals
Red (R)	5	8	13
Yellow (Y)	3	4	7
Totals	8	12	20

- If one bulb is selected at random, find the probability that it will produce a red tulip.
- Given that a randomly selected bulb blooms early, find the probability that it will produce a red tulip.

Q.8 A lot contains 12 items of which 4 are defective. Three items are drawn at random from the lot one after the other. Find the probability p that all 3 are non-defective.

Q.9 Given a family with two children, find the probability that both are boys given at least one is a boy.

Q.10 A Pap smear is a screening procedure used to detect cervical cancer. For women with this cancer, there are about 16% false negatives. For women without cancer, there are about 10% false positives. If pap smear test is positive what is the probability that someone actually has cervical cancer. Assuming, 8 women in 100,000 have this cancer.

Q.11 Suppose only horses a, b, c, d race together yielding the sample space $S = \{a, b, c, d\}$, and suppose the probabilities of winning are as follows:

$P(a) = 0.2$, They race three times.

$P(b) = 0.5$,

$P(c) = 0.1$,

$P(d) = 0.2$

(a) Describe and find the number of elements in the product probability space S^3 .

(b) Find the probability that the same horse wins all three races.

(c) Find the probability that a, b, c each wins one race.