**Question 1**

A fair coin is tossed three times. Write out the sample space S.

Write the sample points of the following events

(a) the event that the first toss is heads

(b) the event that the second toss is heads

(c) exactly two heads in a row.

**Question 2**

A couple has two children; the sample space is S = {bb, bg, gb, gg} with probability 0.25 for each sample point. Find the probability ***p*** that both children are girls if it is known that:

(a) at least one of the children is a girl;

(b) the older child is a girl.

**Question 3**

Compute the probability p of each event:

(a) An even number appears in the toss of a fair die;

(b) One or more tails appear in the toss of three fair coins;

(c) A blue marble appears in a random drawing of one marble from a box containing four white, three blue, and five red marbles.

**Question 4**

Suppose a student is selected at random from 100 students where 30 are taking mathematics, 20 are taking computer science, and 10 are taking mathematics and computer science. Find the probability p that the student is taking mathematics or computer science.

**Question 5**

A lot contains 13 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 three are non-defective.

**Question 6**

The probability that A hits a target is 1/3 and the probability that B hits a target is 1/5. They both fire at the target. Find the probability that:

(a) A does not hit the target;

(b) both hit the target;

(c) only one of them hits the target;

(d) at least one hits the targetl

(d) neither hits the target.

**Question 7**

On completion of a programming project, four programmers from a team submit a collection of subroutines to an acceptance group. The following table shows the percentage of subroutines each programmer submitted and the probability that a subroutine submitted by each programmer will pass the certification test based on historical data.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Programmer | A | B | C | D |
| Proportion of subroutines submitted | 0.10 | 0.20 | 0.30 | 0.40 |
| Probability of acceptance | 0.55 | 0.60 | 0.95 | 0.75 |

(i) What is the proportion of subroutines that pass the acceptance test?

(ii) After the acceptance tests are completed, one of the subroutines is selected at random and found to have passed the test. What is the probability that it was written by Programmer A?

**Question 8**

Two manufacturing plants produce similar parts. Plant A produces 1000 parts, 100 of which are defective. Plant B produces 2000 parts, 170 of which are defective.

1. Present this information using a contingency table
2. A part is selected at random and found to be defective. What is the probability that it came from plant A ?

**Question 9.**

A machine is composed of 2 components A and B, which function independently of one another. The machine works only if both components are working. The probability that component A works is 0.98 and the probability that component B works is 0.95.

1. What is the probability that the machine works,
2. What is the probability that both components have failed.

**Question 10.**

The random variables X and Y have the following joint distribution

|  |  |  |  |
| --- | --- | --- | --- |
|  | Y=0 | Y=1 | Y=2 |
| X=0 | 2/10 | 1/10 | 2/10 |
| X=1 | 0/10 | 2/10 | 1/10 |
| X=2 | 1/10 | 0/10 | 1/10 |

1. Calculate the marginal distributions of X and Y.
2. What is the expected value of X?
3. What is the expected value of Y?