POSTAL Book Package 2023

Computer Science & IT

Objective Practice Sets

Discrete and Engineering Mathematics

Contents

MADE EASY Publications

5 CHAPTER

Probability

Multiple Choice Questions & NAT Questions

Q.1 There are four machines and it is known that exactly two of them are faulty. They are tested one by one in a random order till both the faulty machines are identified. The probability that only two tests are required?

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$

(c) $\frac{1}{4}$ (d) $\frac{1}{6}$

Q.2 Let A and B be any two arbitrary events, then, which one of the following is true?

(a) $P(A \cap B) = P(A)\,P(B)$

(b) $P(A \cup B) = P(A) + P(B)$

(c) $P(A \mid B) = P(A \cap B)/P(B)$

(d) $P(A \cup B) < P(A) + P(B)$

Q.3 Let $f(x)$ be the continuous probability density function of a random variable x, the probability that $a < x \le b$, is

(a) $f(b - a)$ (b) $f(b) - f(a)$

(c) $\int_a^b f(x)dx$ (d) $\int_a^b xf(x)dx$

Q.4 A fair six sided die is thrown twice. If the sum of the face values of these two tosses is 5 then what is the probability that the face value of the first toss is less than that of second toss?

Q.5 In a certain year, there were exactly four Fridays and exactly four Mondays in January. On what day of the week did the 20^{th} of the January fall that year (recall that January has 31 days)?

(a) Sunday (b) Monday

(c) Wednesday (d) Friday

Q.6 Candidates were asked to an interview with 3 pens each. Black, Blue, green and red were the permitted pen colours that candidate could bring. The probability that a candidate comes with all 3 pens having the same order is _____. (Upto 1 decimal)

Q.7 Two dice are thrown simultaneously. The probability that at least one of them will have 6 facing up is

(a) $\frac{1}{36}$ (b) $\frac{1}{3}$

(c) $\frac{25}{36}$ (d) $\frac{11}{36}$

Q.8 Two doctors Anand and Baala perform surgery on patients III and IV of a disease. Doctor Anand has performed a 100 surgeries (on 80 stage III and 20 stage IV patients) and 80 out of her 100 patients have survived (78 stage III and 2 stage IV survivors).

Doctors Baala has also performed 100 surgeries (on 50 stage III and 50 stage IV patients). Her success rate is $\frac{60}{100}$ (49 stage III survivors and 11 stage IV survivors). A patient has been advised that she is equally likely to be suffering from stage III or stage IV of this disease.

Which doctor would you recommend to this patient and why?

(a) Doctor Anand since she specializes in stage III patients and the success of surgery in stage IV patients in anyway too low.

(b) Doctor Baala since she has performed more stage IV surgeries.

(c) Doctor Baala since she appears to be more successful.

(d) Doctor Anand since he appear to be more successful.

Q.9 Manish and Rahul are family-members. They decide to go on trip so they decide to meet for planning between 1:00 pm to 2:00 pm on a given day. There is a condition that whoever arrives first

will not wait for the other for more than 15 minutes. The probability that they will on that day is:

(a) $\frac{1}{4}$ (b) $\frac{1}{16}$

(c) $\frac{7}{16}$ (d) $\frac{9}{16}$

Q.10 Aishwarya studies either computer science or mathematics everyday. If she studies computer science on a day, then the probability that she studies mathematics the next day is 0.6. If she studies mathematics on a day, then the probability that she studies computer science the next day is 0.4. Given that Aishwarya studies computer science on Monday, what is the probability that she studies computer science on Wednesday?

(a) 0.24 (b) 0.36

(c) 0.4 (d) 0.6

Q.11 Consider a large village, where only two newspapers P_1 and P_2 are available to the families. It is known that the proportion of families

1. Not taking P_1 is 0.48
2. Not taking P_2 is 0.58.
3. Taking only P_2 is 0.30.

The probability that a randomly chosen family from the village takes only P_1 is

(a) 0.24

(b) 0.28

(c) 0.40

(d) Cannot be determined

Q.12 A determinant is chosen at random from the set of all determinants of order 2 with element 0 or 1 only. The probability of choosing a non-zero determinant is

(a) $\frac{3}{16}$ (b) $\frac{3}{8}$

(c) $\frac{1}{4}$ (d) None of these

Q.13 *A* and *B* are friends. They decide to meet between 1:00 pm and 2:00 pm on a given day. There is a condition that whoever arrives first will not wait for the other for more than 15 minutes. The probability that they will meet on that day is

(a) $\frac{1}{4}$ (b) $\frac{1}{16}$

(c) $\frac{7}{16}$ (d) $\frac{9}{16}$

Q.14 What is the probability that in a randomly chosen group of r people at least three people have the birthday on the same date of the year?

(a) $1-\frac{365.364...(365-r+1)}{365^r}$

(b) $1-\frac{365.364...(365-r+1)}{365^r}+{}^rC_2\cdot 365\cdot\frac{364.363...(364-(r-2)+1)}{364^{r-2}}$

(c) $1-\frac{365.364...(365-r+1)}{365^r}-{}^rC_2\cdot 365\cdot\frac{364.363...(364-(r-2)+1)}{364^{r-2}}$

(d) $\frac{365.364...(365-r+1)}{365^r}$

Q.15 A typical page in a book contains one typo per page. What is the probability that there are exactly 8 typos in a given 10-page chapter?

(a) $e^{-10}\cdot\frac{10^8}{8!}$ (b) $e^{-8}\frac{8^{10}}{10!}$

(c) $e^{-8}\frac{10^8}{8!}$ (d) None of these

Q.16 A six card hand is dealt from an ordinary deck of cards. Find the probability that there are 3 cards of one suit and 3 of another suit.

(a) $\frac{{}^{13}C_6}{{}^{52}C_6}$ (b) $\frac{({}^{13}C_3)^2}{{}^{52}C_6}$

(c) $\frac{2({}^{13}C_3)^2}{{}^{52}C_6}$ (d) $\frac{6({}^{13}C_3)^2}{{}^{52}C_6}$

Q.17 A bag contains 10 blue marbles, 20 green marbles and 30 red marbles. A marble is drawn from the bag, its colour recorded and it is put back in the bag. This process is repeated 3 times. The probability that no two of the marbles drawn have the same colour is

(a) $\frac{1}{36}$ (b) $\frac{1}{6}$

(c) $\frac{1}{4}$ (d) $\frac{1}{3}$

Q.18 If P and Q are two random events, then the following is TRUE

Answers Probability

1.	(d)	2.	(c)	3.	(c)	4.	(0.5)	5.	(a)	6.	(0.2)	7.	(d)	8.	(c)	9.	(c)
10.	(c)	11.	(c)	12.	(a)	13.	(c)	14.	(c)	15.	(a)	16.	(d)	17.	(b)	18.	(b)
19.	(d)	20.	(b)	21.	(d)	22.	(d)	23.	(b)	24.	(c)	25.	(c)	26.	(d)	27.	(b)
28.	(d)	29.	(c)	30.	(b)	31.	(0.75)	32.	(a)	33.	(a)	34.	(0.4)	35.	(57.14)	36.	(d)
37.	(a)	38.	(d)	39.	(c)	40.	(b)	41.	(b)	42.	(c)	43.	(b)	44.	(c)	45.	(b)
46.	(0.51)	47.	(a)	48.	(a)	49.	(b)	50.	(b)	51.	(b)	52.	(a)	53.	(1692)	54.	(0.94)
55.	(c)	56.	(b)	57.	(d)	58.	(a)	59.	(c)	60.	(b)	61.	(b)	62.	(a)	63.	(d)
64.	(c)	65.	(b)	66.	(b)	67.	(b)	68.	(0.04)	69.	(0.22)	70.	(b)	71.	(0.1)	72.	(b)
73.	(c)	74.	(a, c)	75.	(a, d)	76.	(a, b)	77.	(a, b, c)	78.	(a, b, c, d)	79.	(a, b)	80.	(b, c)		

Explanations Probability

1. (d)

There are 4 machines M_1, M_2, M_3, M_4.

Here say M_3, M_4 are faulty.

So, we can select it either by M_3, M_4 or M_4, M_3 = 2 ways.

Now, among 4 machines, we can select 2 in (4) × (3) ways = 12 ways.

So, total probability that only 2 test cases required to get both machines are faulty is $\frac{2}{12} = \frac{1}{6}$

So, option (d) is correct.

2. (c)

(a) $P(A \cap B) = P(A)\,P(B)$ is false since this is true if and only if A and B are independent events.

(b) $P(A \cup B) = P(A) + P(B)$ is false since $P(A \cap B)$ is zero if and only if A and B are mutually exclusive.

(c) $P(A \mid B) = P(A \cap B)/P(B)$ is true.

(d) $P(A \cup B) < P(A) + P(B)$ is false.
Since $P(A \cup B) \le P(A) + P(B)$

3. (c)

If $f(x)$ is the continuous probability density function of a random variable X then,

$p(a < x \le b) = p(a \le x \le b)$

$$= \int_a^b f(x)dx$$

4. (0.5)

Total number of possible pairs = 36

$\{(a,b) \mid 1 \le a \le 6,\ 1 \le b \le 6\}$

(*i*) Sum of face values = 5
{(1,4), (2,3), (3,2), (4,1)}

(*ii*) First toss is less than that of second toss.
{(1,4), (2,3)}

$\therefore$ Probability $= \frac{2}{4} = \frac{1}{2}$

5. (a)

January has 31 days, no of complete weeks in

January $= \left(\frac{31}{7}\right) = 4$

Then remaining days 31 – 7(4) = 3 since mentioned there are exactly 4 Mondays and 4 Fridays then these Monday and Fridays are already covered in the 4 complete weeks. Hence, for these 3 days we need 5 consecutive days other than Monday and Friday.

The only 3 consecutive days other than Monday and Friday is:

29th Jan → Tuesday

30th Jan → Wednesday

31st Jan → Thursday

Then the 4 Monday are:

28th Jan → Monday

21st Jan → Monday
14th Jan → Monday
7th Jan → Monday
Thus, 20th Jan → Sunday
Hence, option (a) is answer.

6. (0.2)

Probability of all 3 pens being same colour.
= number of ways of choosing 3 pens of same colour/Total number of ways of choosing 3 pens
= 4/[4 + (4 × 3) + C(4,3)] = 4/20 = 0.2

7. (d)

P(atleast one of dice will have 6 facing
$= 1 - P$(none of dice have 6 facing up)

$$= 1-\left[\frac{5}{6}\times\frac{5}{6}\right] = 1-\frac{25}{36} = \frac{11}{36}$$

8. (c)

As, % of Doctor Anand successful for stage III

$$= \frac{78}{80}\times 100 = 97.5$$

$$\text{For stage IV} = \frac{2}{20}\times 100 = 10$$

As, % of doctor Baala successful for stage III

$$= \frac{49}{50}\times 100 = 98$$

$$\text{For stage IV} = \frac{11}{50}\times 100 = 22$$

In both cases, Doctor Baala is more successful.
So, option (c) is correct.

9. (c)

Probability that one person meet on that day

$$= \frac{15}{60} = \frac{1}{4}$$

Probability (failing to meet by both the persons)

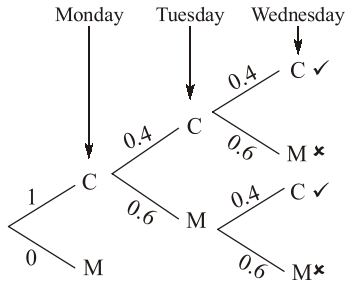
$$= \frac{3}{4}\times\frac{3}{4} = \frac{9}{16}$$

Probability (meet on that day by both the persons)

$$= 1-\frac{9}{16} = \frac{7}{16}$$

10. (c)

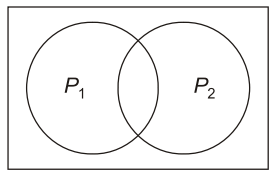
Let C denote computes science study and M denotes maths study. The tree diagram for the problem can be represented as shown below:



Now by rule of total probability we total up the desired branches (✓) and get the answer as shown below:

p(C on <Monday and C on Wednesday)
= p(C on Monday, C on Tuesday and C on Wednesday) + p(C on Monday, M on Tuesday and C on Wednesday)
= 1 × 0.4 × 0.4 + 1 × 0.6 × 0.4
= 0.16 + 0.24 = 0.40

11. (c)



only $P_2 = 0.30$

Not P_1 = only $P_2 + \overline{P_1 \cup P_2} = 0.48$

$\overline{P_1 \cup P_2} = 0.48 - 0.3 = 0.18$

Not P_2 = only $P_1 + \overline{P_1 \cup P_2} = 0.58$

Only $P_1 = 0.58 - 0.18 = 0.40$
So, option (c) is correct.

12. (a)

With 0 and 1,
The number of determinants possible $2^4 = 16$ as for every location of 0 and 1 there are 4 choices in total.
Now, there are only 3 determinants with positive values:

$$\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}, \begin{bmatrix}1 & 1\\ 0 & 1\end{bmatrix}, \begin{bmatrix}1 & 0\\ 1 & 1\end{bmatrix}$$

So, the probability of choosing a non-zero determinant

$$\frac{\text{Total non-zero determinants possible}}{\text{Total determinants possible}} = \frac{3}{16}$$