Unit No. 13

Probability

Exercise No. 13.1

Question No. 1

Arshad rolls a dice, with sides labelled L, M, O, P, U. What is the probability that the dice lands on a consonant?

Solution:

Number of letters = n = 6 = n(S)

No. of vowels = n(O) = 2

No. of consonants = n(A) = 6−2 = 4

(Since O, U are not consonants)

Using;

$P(A) = \frac{n(A)}{n(S)} = \frac{4}{6} = \mathbf{\frac{2}{3}}$

Question No. 2

Shazia throws a pair of fair dice. What will be the probability of getting;

(i) sum of dots is at least 4.

(ii) product of both dots is between 5 to 10.

(iii) the difference between both the dots is equal to 4.

(iv) number at least 5 on the first dice and the number at

least 4 on the second dice.

Solution:

When a pair of fair dice is rolled, the sample space will be:

	1	2	3	4	5	6
1	(1, 1)	(1, 2)	(1, 3)	(1, 4)	(1, 5)	(1, 6)
2	(2, 1)	(2, 2)	(2, 3)	(2, 4)	(2, 5)	(2, 6)
3	(3, 1)	(3, 2)	(3, 3)	(3, 4)	(3, 5)	(3, 6)
4	(4, 1)	(4, 2)	(4, 3)	(4, 4)	(4, 5)	(4, 6)
5	(5, 1)	(5, 2)	(5, 3)	(5, 4)	(5, 5)	(5, 6)
6	(6, 1)	(6, 2)	(6, 3)	(6, 4)	(6, 5)	(6, 6)

(i) Sum of dots is at least 4.

(1, 3), (1, 4), (1, 5), (1, 6), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6), (3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (3, 6), (4, 1),(4, 2), (4, 3), (4, 4), (4, 5), (4, 6), (5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6), (6, 1), (6, 2), (6, 3), (6, 4), (6, 5),(6, 6)

Solution:

No. of favourable outcomes = n(A) = 33

$P(A) = \frac{n(A)}{n(S)} = \frac{33}{36} = \mathbf{\frac{11}{12}}$

(ii) Product of both dots is between 5 and 10.

(1, 5), (1,6), (2, 3), (2, 4), (2, 5), (5, 1), (3, 2), (3, 3), (4, 2), (5, 2), (6, 1)

Solution:

No. of favourable outcomes = n(A) = 11

n(S) = 36

$P(A) = \frac{n(A)}{n(S)} = \mathbf{\frac{11}{36}}$

(iii) the difference between both the dots is equal to 4.

Solution:

Favourable outcomes are; (1, 5), (2, 6), (5, 1), (6, 2)

No. of favourable outcomes = n(A) = 4

n(S) = 36

$P(A) = \frac{n(A)}{n(S)} = \frac{4}{36} = \mathbf{\frac{1}{9}}$

(iv) There are six outcomes having at least 5 on the first dice and the number at least 4 on the second dice.

Solution:

No. of favourable outcomes = n(A) = 6

n(S) = 36

$P(A) = \frac{n(A)}{n(S)} = \frac{6}{36} = \mathbf{\frac{1}{6}}$

Question No. 3

One alphabet is selected at random from the word "MATHEMATICS".

Find the probability of getting:

(i) vowel

(ii) consonant

(iii) an E

(iv) an A

(v) not M

(vi) not T

Solution:

The word is MATHEMATICS

(i) Total letters in the word MATHEMATICS,

n(S) = 11

No. of vowels dot = n(A) = 4

Probability of getting vowel = P(A) = $\frac{n(A)}{n(S)} = \mathbf{\frac{4}{11}}$

(ii) No. of consonants = 11 – 4

n(A) = 7

n(S) = 11

Probability of getting consonants = P(A) = $\frac{n(A)}{n(S)} = \mathbf{\frac{7}{11}}$

(iii) an "E"

n(A) = 1

n(S) = 11

Probability of getting "E" = P(A) = $\frac{n(A)}{n(S)} = \mathbf{\frac{1}{11}}$

(iv) an "A"

Here A appears twice.

So, n(A) = 2

n(S) = 11

Probability of getting "A" = P(A) = $\frac{n(A)}{n(S)} = \mathbf{\frac{2}{11}}$

(v) not "M"

Here M appears twice;

But not "M";

So, n(A) = 11 – 2 = 9

n(S) = 11

Probability of getting not "M" = P(A) = $\frac{n(A)}{n(S)} = \mathbf{\frac{9}{11}}$

(vi) not "T"

Here T appears twice;

But not "T";

So, n(A) = 11 – 2 = 9

n(S) = 11

Probability of getting not "T" = P(A) = $\frac{n(A)}{n(S)} = \mathbf{\frac{9}{11}}$

Question No. 4

Aslam rolled a dice. What is the probability of getting the numbers 3 or 4? Also find the probability of not getting the numbers 3 or 4.

Solution:

- Finding probability of getting the numbers 3 to 4.

Total outcomes = n(S) = 6

Favourable outcomes = n(A) = 2

Probability of getting the numbers 3 to 4 = P(A) = $\frac{n(A)}{n(S)} = \frac{2}{6} = \mathbf{\frac{1}{3}}$

- Finding Probability of **not** getting the numbers 3 or 4.

Total outcomes = n(S) = 6

Favourable outcomes = n(A) = 2

P(A) = $\frac{1}{3}$

Probability of **not** getting the numbers 3 to 4 = P(A′) = 1 - $\frac{1}{3} = \frac{3-1}{3} = \mathbf{\frac{2}{3}}$

Question No. 5

Abdul Hadi labelled cards from 1 to 30 and put them in a box. He selects a card at random. What is the probability that selected card containing:

(i) the number 25

Solution:

Total outcomes = n(S) = 30

Favourable outcomes = n(A) = 1 (the number 25)

Probability that selected card contains the number 25 = P(A) = $\frac{n(A)}{n(S)} = \mathbf{\frac{1}{30}}$

(ii) number between 17 to 22

Solution:

Total outcomes = n(S) = 3 0

Favourable outcomes = n(A)= 6 (17, 18, 19, 20, 21, 22)

Probability that selected card contains the number between 17 to 22 = P(A) = $\frac{n(A)}{n(S)} = \frac{6}{30} = \mathbf{\frac{1}{5}}$

(iii) number at least 20

Solution:

Total outcomes = n(S) = 30

Favourable outcomes = n(A) = 11 (20,21,22,23,24,25,26,27,28,29,30)

Probability that selected card contains the number at least 20 = P(A) = $\frac{n(A)}{n(S)} = \mathbf{\frac{11}{30}}$

(iv) number not 27 and 29

Solution:

Total outcomes = n(S) = 30

Number **not** 27 and 29;

Favourable outcomes = n(A) = 30 – 2 = 28

Probability that selected card contains the number not 27 and 29 = P(A) = $\frac{n(A)}{n(S)} = \frac{28}{30} = \mathbf{\frac{14}{15}}$

(v) number not between 12 - 15

Solution:

Total outcomes = n(S) = 30

Favourable outcomes = n(A) = 30 – 4 = 26 (outcomes contain those numbers which are not between 12 - 15)

Probability that selected card contains the number not between 12 - 15 = P(A) = $\frac{n(A)}{n(S)} = \frac{26}{30} = \mathbf{\frac{13}{15}}$

Question No. 6

The probability that Ayesha will pass the examination is 0.85. What will be the probability that Ayesha will not pass the examination?

Data:

Probability that Ayesha will pass the examination = P(A) = 0.85

Probability that Ayesha will not pass examination = ?

Solution:

P(A′) + P(A) = 1

P(A′) = 1 - P(A)

P(A′) = 1 − 0.85

P(A′) = 0.15

Where A′ denotes Ayesha will not pass examination.

Question No. 7

Taabish tossed a fair coin and rolled a fair dice once. Find the probability of the following events:

(i) fail on coin and at least 4 on dice.

Solution:

- **For coin:**

Favourable outcome = n(A) = 1

n(S) = 2

P(A) = $\frac{n(A)}{n(S)} = \mathbf{\frac{1}{2}}$

- **For dice:**

Favourable outcome n(B) = 3

n(S) = 6

P(A) = $\frac{n(A)}{n(S)} = \frac{3}{6} = \mathbf{\frac{1}{2}}$

Probability of events = P(A) × P(B)

Probability of events = $\frac{1}{2} \times \frac{1}{2} = \mathbf{\frac{1}{4}}$

(ii) head on coin and the number 2,3 on dice.

Solution:

- **Head on coin, probability:**

Head on coin, probability = $\mathbf{\frac{1}{2}}$

- **On dice, the numbers 2, 3:**

On dice, the numbers 2, 3 probability = $\frac{2}{6} = \mathbf{\frac{1}{3}}$

Probability of events = $\frac{1}{2} \times \frac{1}{3} = \mathbf{\frac{1}{6}}$

(iii) Head and tail on coin and the number 6 on dice.

Solution:

- **Head and tail on coin.**

Favourable outcomes = 2

Probability = $\frac{2}{2} = \mathbf{1}$

- **Number 6 on dice.**

No. of Favourable outcomes = 1

Probability = $\mathbf{\frac{1}{6}}$

Required Probability = $1 \times \frac{1}{6} = \mathbf{\frac{1}{6}}$

(iv) not tail on coin and the number 5 on dice.

Solution:

- **Not-tail on coin.**

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

- **Number 5 on dice.**

Probability = $\frac{1}{6}$

Required probability = $\frac{1}{2} \times \frac{1}{6} = \mathbf{\frac{1}{12}}$

(v) not head on coin and the number 5 and 2 on dice.

Solution:

- **Not head.**

Probability = $\mathbf{\frac{1}{2}}$

- **Number 5 and 2 on dice.**

Probability = $\frac{1}{6} + \frac{1}{6} = \frac{2}{6} = \frac{1}{3}$

Let A be the event, then;

P(A) = $\frac{1}{2} + \frac{1}{3} = \frac{3+2}{6} = \mathbf{\frac{5}{6}}$

Question No. 8

A card is selected at random from a well shuffled pack of 52 plying cards.

What will be the probability of selecting;

(i) a queen.

Solution:

No. of favourable outcomes = n(A) = 4 (Queen)

Total possible outcomes = n(S) = 52

Probability of selecting a queen = P(A) = $\frac{n(A)}{n(S)} = \frac{4}{52} = \mathbf{\frac{1}{13}}$

(ii) neither a queen nor a jack.

Solution:

No. of jacks in a deck of 52 cards = 4

No. of queen in a deck of 52 cards = 4

Total no. of queen and jack = 4 + 4 = 8

No. of cards which is neither a queen nor a jack = 52 – 8 = 44

Probability P(E) = $\frac{\text{No.of outcomes favourable to E}}{\text{Number of all possible outcomes of the experiment}} = \frac{44}{52} = \mathbf{\frac{11}{13}}$

Question No. 9

A card is chosen at random from a pack of 52 playing cards. Find the probability of getting:

(i) a jack.

Solution:

No. of jack = 4

So, probability of getting a jack = $\frac{4}{52} = \mathbf{\frac{1}{13}}$

(ii) no diamond.

Solution:

Given, a standard deck of 52 cards, we have to find the probability of getting no diamond.

There are 13 cards of diamond in a 52-card deck.

So, probability of getting **no** diamond = $1 - \frac{13}{52} = \frac{52-13}{52} = \frac{39}{52} = \mathbf{\frac{3}{4}}$