

MATHEMATICS NOTES FOR 7TH CLASS (FOR ISLAMABAD)

Chapter 13

PROBABILITY

Exercise 13.1

1. A jar contains 12 cards numbered 1 to 12.

One card is drawn at random from the jar.

- (i) List the elements of the sample space S .

Ans. $S = \{1, 2, 3, 4, \dots, 12\}$

- (ii) If E is the event of drawing a multiple of 4, then list the favourable outcomes of the event E and state $n(E)$.

Ans. $E = \{4, 8, 12\}$, $n(E) = 3$.

2. A box contains one red marble, two green marbles and two white marbles. A marble is drawn at random from the box.

- (i) List the elements of the sample space S and state $n(S)$.

Ans. $S = \{R_1, G_1, G_2, W_1, W_2\}$, $n(S) = 5$.

- (ii) If E is the event of not drawing a white marble, list the favourable outcomes of the event E and state $n(E)$.

Ans. $E = \{R_1, G_1, G_2\}$, $n(E) = 3$

3. A school has several coloured school buses: 2 red, 2 blue and 4 white. Every morning, the driver uses a bus randomly to fetch students living in the east. If any bus must be chosen,

- (i) List the outcomes of the sample space S .

Ans. $S = \{R_1, R_2, B_1, B_2, W_1, W_2, W_3, W_4\}$

- (ii) State $n(S)$.

Ans. $n(S) = 8$.

4. There are 18 jellybeans on the table. Eight jellybeans are red, one is white and three are yellow. There are also two green, two black and two orange jellybeans. Ali picks a jellybean at random. What is the probability of randomly picking a red jelly bean?



Ans. Total jellybeans = 18

Red jelly beans = 8

$$P = \frac{n(E)}{n(S)} = \frac{8}{18} = \frac{4}{9}$$

5. Ayesha chooses a hat from four hats in her wardrobe (as shown) to wear on a sunny day.

What's the probability of her choosing:



- (i) The Purple Hat?

Ans. $P = \frac{n(E)}{n(S)} = \frac{1}{4}$

- (ii) The hat with the black bow?

Ans. $P = \frac{n(E)}{n(S)} = \frac{2}{4} = \frac{1}{2}$

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6. Each of the 6 letters of the word **CHANCE** is written on a card. A card is drawn at random.

Find the probability that the card has:

(i) The written letter 'H'.

Ans. $P = \frac{n(E)}{n(S)} = \frac{1}{6}$

(ii) The written letter 'C'.

Ans. $P = \frac{n(E)}{n(S)} = \frac{2}{6} = \frac{1}{3}$

(iii) A letter that is consonant.

Ans. $n(E) = \{C, H, N, C\}$
 $P = \frac{n(E)}{n(S)} = \frac{4}{6} = \frac{2}{3}$

7. A spinner is divided into eight equal sectors numbered 1 to 8. The spinner is spun and the sector on which the spinner stops is noted down. What is the probability of the spinner stopping at:

(i) Any of the sectors?

Ans. $P = \frac{n(E)}{n(S)} = \frac{1}{8}$

(ii) An even-numbered sector?

Ans. Even-number = $\{2, 4, 6, 8\}$
 $P = \frac{n(E)}{n(S)} = \frac{4}{8} = \frac{1}{2}$

(iii) A sector whose number is greater than 5?

Ans. Number greater than 5 = $\{6, 7, 8\}$
 $P = \frac{n(E)}{n(S)} = \frac{3}{8}$

8. Aliad randomly picks a card from a pack of 52 playing cards. Find the probability that it is:

(i) A queen of hearts,

Ans. A queen of hearts $n(E) = 1$

$$P = \frac{n(E)}{n(S)} = \frac{1}{52}$$

(ii) A heart,

Ans. heart $n(E) = 13$

$$P = \frac{n(E)}{n(S)} = \frac{13}{52} = \frac{1}{4}$$

(iii) A red card,

Ans. Red cards = $n(26)$

$$P = \frac{n(E)}{n(S)} = \frac{26}{52} = \frac{1}{2}$$

(iv) A picture card.

Ans. Picture card = $n(12)$

$$P = \frac{n(E)}{n(S)} = \frac{12}{52} = \frac{3}{13}$$

9. A number is chosen at random from the numbers 1, 2, 3, ..., 20. Find the probability that the number chosen is:

(i) A multiple of 6,

Ans. Multiple of 6 = 6, 12, 18 $n(E) = 3$

$$P = \frac{n(E)}{n(S)} = \frac{3}{20}$$

(ii) A prime number,

Ans. Prime number = 1, 3, 5, 7, 11, 13, 17, 19

$$n(E) = 8$$

$$P = \frac{n(E)}{n(S)} = \frac{8}{20} = \frac{2}{5}$$

(iii) A perfect cube.

Ans. Perfect cube = 1, 8 $n(E) = 2$

$$P = \frac{n(E)}{n(S)} = \frac{2}{20} = \frac{1}{10}$$

10. A total of 300 tickets numbered 1 to 300 are sold in a lottery. Each ticket has an equal chance of being the winning ticket. If Nahyan has 6 tickets, find the probability that:

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(i) *He has the winning ticket,*

Ans. Nahyan has tickets = $n(E) = 6$

$$P = \frac{n(E)}{n(S)} = \frac{6}{300} = \frac{1}{50}$$

(ii) *He does not have the winning ticket.*

Ans. $P = \frac{n(E)}{n(S)} = \frac{294}{300} = \frac{49}{50}$

11.(a) *An ordinary six-sided dice is rolled. Calculate the probability of:*

(i) *getting a 3*

(ii) *not getting a 3*

Ans. (a) $S = \{1, 2, 3, \dots, 6\}$

$$n(S) = 6$$

(i) $P(3) = \frac{1}{6}$

(ii) $P(\text{not } 3) = 1 - \frac{1}{6} = \frac{5}{6}$

12. *A six-sided dice is rolled. If*

$P(6) = \frac{1}{3}$. *Calculate the probability of:*

(i) *not getting a 6*

(ii) *either getting a 6 or not getting a 6.*

Ans. (i) $P(\text{not } 6) = 1 - \frac{1}{3} = \frac{2}{3}$

(ii) $P(6) + P(\text{not } 6) = \frac{1}{3} + \frac{2}{3} = 1$

13. *A bag contain 2 red balls, 3 green ball, and 4 yellow ball. Two balls are drawn at random one at a time from the bag with replacement.*

Let: X be the event that both balls drawn are red,

Y be the event that at least one of the balls drawn is red,

Z be the event that at least one of the balls drawn is yellow.

Determine whether each of the following pair of events is mutually exclusive not. Explain your answer.

(i) *X and Y*

(ii) *X and Z*

(iii) *Y and Z*

Ans. (i) X and Y can happen at the same time, hence they are not mutually exclusive.

(ii) X and Z cannot happen at the same time, hence they are mutually exclusive.

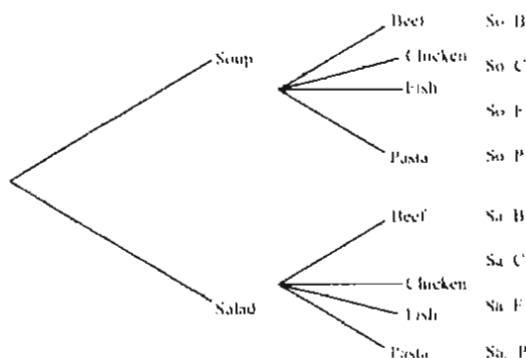
(iii) Y and Z can happen at the same time, hence, they are not mutually exclusive.

Exercise 13.2

1. *Draw a tree diagram to show the sample space for each situation. Then indicate how many outcomes are possible?*

(i) *a choice of soup or salad with beef, chicken fish or pasta.*

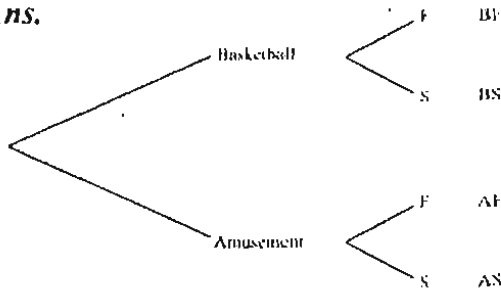
Ans.



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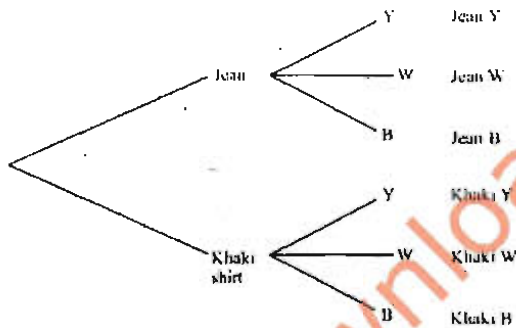
- (ii) a choice of going to a basketball game, an amusement park, or a concert on either Friday or Saturday.

Ans.



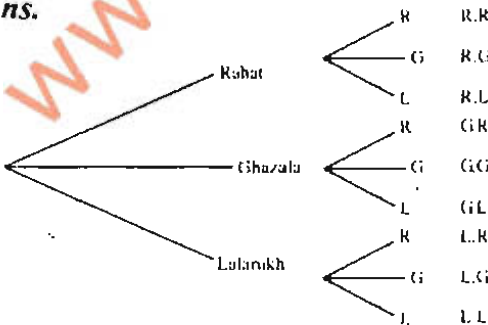
2. Use a tree diagram to find how many outfits are possible from a choice between jeans or khaki shirts and a choice of a yellow, white, or blue shirt?

Ans.



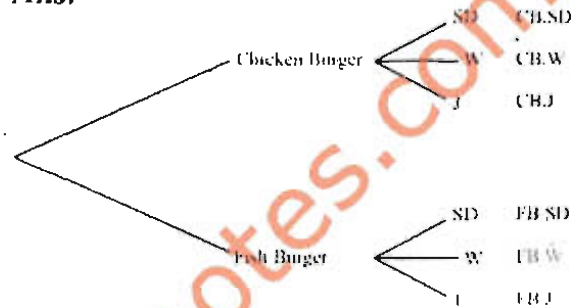
3. How many ways can Rahat, Ghazala and Lalarukh line up to check out library books? Make an organized list to show the sample space.

Ans.



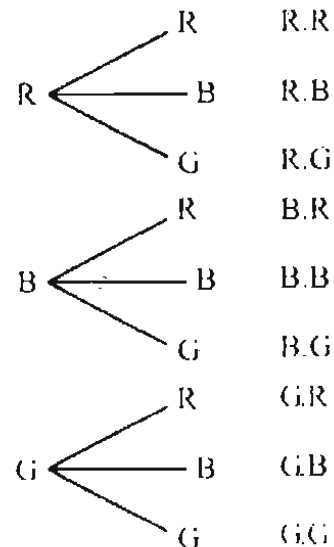
4. Use a tree diagram to find how many burgers and drink combinations can be made if you choose from a chicken burger or fish burger with a soft drink, water, or juice?

Ans.



5. There are some red socks, blue socks and green socks in a drawer. Sara picks two socks from the drawer. Draw a tree diagram to show all possible outcomes.

Ans.

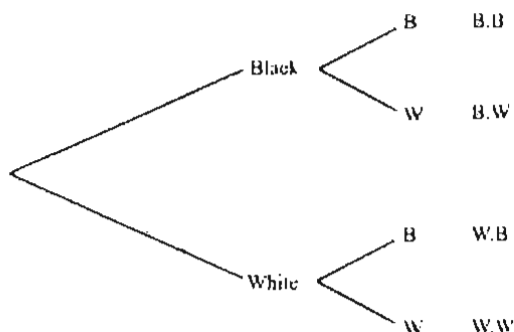


6. A bag contain two balls. One ball is black and one ball is white. A ball is taken out of the bag at random and then put back.

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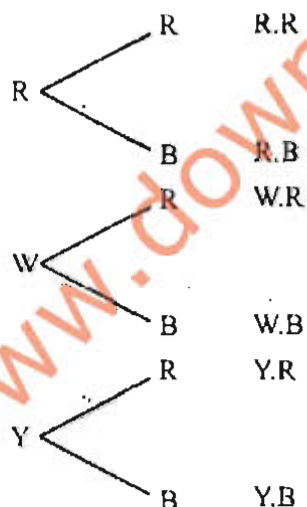
Another ball is taken out of the bag at random. Draw a tree diagram to show all possible outcomes.

Ans.



7. A counter is picked at random from a bag containing a red white and a yellow counter, then another counter is picked at random from a different bag containing a red and a blue counter. Draw a tree diagram to show all possible outcomes.

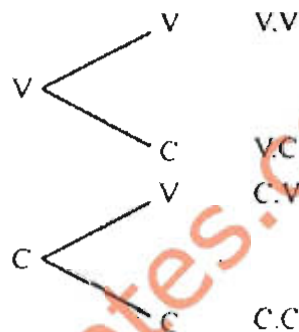
Ans.



8. An ice cream shop sells two flavours of ice cream, Vanilla (V) and Chocolate (C). Two people

chosen at random buy an ice cream. Draw a tree diagram to show the flavours they can choose.

Ans.



Review Exercise 13

1. Encircle the correct option in the following statements.

- (i) Probability of 0 means that the event is _____ to happen.

- ✓(a) impossible (b) unlikely
(c) likely (d) certain

- (ii) Probability of 1 means that the event is _____ to happen.

- (a) impossible (b) unlikely
(c) likely ✓(d) certain

- (iii) The set of all possible outcomes of an experiment is:

- (a) event ✓(b) sample space
(c) favourable outcome
(d) combined outcome

- (iv) The outcomes of a trial involving two combined events can be shown by:

- (a) graph (b) pie chart
(c) table ✓(d) tree diagram

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(v) *The probability that a spinner will land on 5 and a tossed coin will show a head is written as:*

- ✓(a) $P(5, H)$ (b) $P(H, 5)$
(c) $P(1, H)$ (d) $P(1, 1)$

(vi) *The chance that the event will happen is called its:*

- (a) outcome (b) experiment
(c) result ✓(d) likelihood

(vii) *An event is _____ if it has low chance of happening.*

- (a) certain (b) impossible
(c) likely ✓(d) unlikely

(viii) *The probability of drawing a queen from a pack of 52 playing cards is:*

- ✓(a) $\frac{1}{13}$ (b) $\frac{2}{13}$
(c) $\frac{3}{13}$ (d) $\frac{4}{13}$

(ix) *The probability of getting an odd number when a dice is rolled is:*

- (a) $\frac{1}{6}$ (b) $\frac{2}{6}$
✓(c) $\frac{3}{6}$ (d) $\frac{4}{6}$

(x) *The probability of getting a prime number, when a dice is rolled:*

- (a) $\frac{1}{6}$ (b) $\frac{1}{3}$
✓(c) $\frac{1}{2}$ (d) $\frac{2}{3}$

2. *An ordinary unbiased dice numbered one to six is throw once. Find the probability that the number shown on the top face of the dice is:*

(i) *A multiple of 3,*

Ans. Multiple of 3 = 3, 6 $n(E) = 2$

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

(ii) *Less than 7.*

Ans. Less than 7 = 1, 2, 3, 4, 5, 6 $n(E) = 6$

$$P = \frac{n(E)}{n(S)} = \frac{6}{6} = 1$$

3. *A bag contains 36 identical discs. 5 are marked with the letter V. 12 are marked with the letter W. The rest are unmarked. A disk is chosen at random. Find the probability that the disk chosen is:*

(i) *marked,*

Ans. $V + W = 5 + 12 = 17$ $n(E) = 17$

$$P = \frac{n(E)}{n(S)} = \frac{17}{36}$$

(ii) *unmarked.*

Ans. Unmarked = $36 - 17 = 19$ $n(E) = 19$

$$P = \frac{n(E)}{n(S)} = \frac{19}{36}$$

4. *A card is drawn at random from a deck of 52 cards. Find the probability that the card is:*

(i) *A picture card (i.e. a Jack, Queen or King),*

Ans. a Jack, Queen or King $n(E) = 12$

$$P = \frac{n(E)}{n(S)} = \frac{12}{52}$$

(ii) *Not a picture card.*

Ans. Not a picture card = $n(E) = 40$

$$P = \frac{n(E)}{n(S)} = \frac{40}{52} = \frac{10}{13}$$

5. *There are 24 red balls and x white balls in a bag. A ball is drawn random from the bag.*

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Given that the probability that the ball drawn is white is $\frac{3}{7}$.

- (i) *Write down the probability that the ball drawn is red,*

Ans. $P = \frac{n(E)}{n(S)} = 1 - \frac{3}{7} = \frac{4}{7}$

- (ii) *Calculate the value of x .*

Ans. Red ball = $\frac{4 \times 6}{7 \times 6} = \frac{24}{42}$

$x = 3 \times 6 = 18$

6. *A box contains 30 apples, of which 14 are red and 16 are green. An apple is drawn random from the box.*

- (i) *Find the probability of drawing a green apple.*

Ans. Green Apples $n(E) = 16$

$P = \frac{n(E)}{n(S)} = \frac{16}{30} = \frac{8}{15}$

- (ii) *Find the number of red apples to be removed so that the probability of drawing a green apple from the remaining apples in the box is $\frac{2}{3}$.*

Ans. $P(E) = \frac{16}{x}$

$\frac{2}{3} = \frac{16}{x}$

$2x = 48$

$x = \frac{48}{2} = 24$

No. of red apples = $24 - 16 = 8$

7. *A card is randomly selected from a pack of 52 playing cards. Calculate the probability of:*

- (i) *A black card*

Ans. Black cards = $n(E) = 26$

$P = \frac{n(E)}{n(S)} = \frac{26}{52} = \frac{1}{2}$

- (ii) *A king*

Ans. King's in cards = $n(E) = 4$

$P = \frac{n(E)}{n(S)} = \frac{4}{52} = \frac{1}{13}$

- (iii) *A number card that is multiple of 3*

Ans. Multiple of 3 = 3, 6, 9, 12,

$n(E) = 4 = 3(4) = 12$

$P = \frac{n(E)}{n(S)} = \frac{12}{52} = \frac{3}{13}$

- (iv) *An Ace, Jack, Queen and King*

Ans. 4 Ace, 4 Jack, 4 Queen and 4 King

$n(E) = 4 \times 4 = 16$

$P = \frac{n(E)}{n(S)} = \frac{16}{52} = \frac{4}{13}$

8. *A fair ten-sided dice with number from 1 to 10 on it is thrown. Calculate the probability of obtaining:*

- (i) *1*

Ans. $P = \frac{n(E)}{n(S)} = \frac{1}{10}$

- (ii) *an even number*

Ans. Even numbers = 2, 4, 6, 8, 10 $n(E) = 5$

$P = \frac{n(E)}{n(S)} = \frac{5}{10} = \frac{1}{2}$

- (iii) *a number less than 4 but more than 7*

Ans. Less than 4 = 1, 2, 3

More than 7 = 8, 9, 10

$n(E) = 6$

$P = \frac{n(E)}{n(S)} = \frac{6}{10} = \frac{3}{5}$

9. *A spinner in the form of a regular hexagon is constructed. When the pointer is spun, what is the*

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probability that the pointer will stop at:

(i) 6

Ans. $P = \frac{1}{6}$

(ii) *an odd-numbered triangle*

Ans. $n(E) = 3$

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

(iii) *a triangle whose number is a multiple of 3*

Ans. Multiple of 3 = 3, 6, $n(E) = 2$

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

(iv) *a triangle whose number is less than 6*

Ans. Less than 6 = 5 $n(E) = 5$

$$P = \frac{n(E)}{n(S)} = \frac{5}{6}$$

(v) *a triangle whose number is greater than 6*

Ans. Greater than 6 = 0 $n(E) = 0$

$$P = \frac{n(E)}{n(S)} = \frac{0}{6} = 0$$

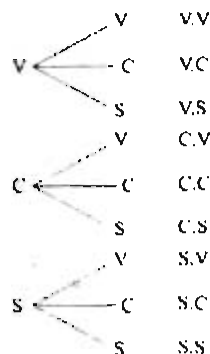
(vi) *a triangle whose number is less than 7*

Ans. Less than seven = 6

$$P = \frac{n(E)}{n(S)} = \frac{6}{6} = 1$$

10. *Aslam sells three flavours of ice cream, Vanilla (V), Chocolate (C) and Strawberry (S). Two people chosen at random buy an ice cream. Draw a tree diagram to show the flavours they can choose.*

Ans.



11. *A class has 40 students. Twenty of them take Mathematics while 25 of them take Statistics. A student of the class is selected at random. Let M be the event that the student takes Mathematics and S be the event that the student takes Statistics. Are the events, M and S, mutually exclusive? Explain briefly.*

Ans. M and S can happen at the same time, so they are not mutually exclusive.

12. *A card is drawn at random from a pack of 52 playing cards. Find the probability that the card drawn is*

(i) *a King or a Queen,*

(ii) *a Queen or a spade.*

Ans. (i) $n(E) = 8$

$$P(E) = \frac{8}{52} = \frac{2}{13}$$

(ii) $n(Q) = 16$

$$P(Q) = \frac{16}{52} = \frac{4}{13}$$