CHAPTER 15 PROBABILITY

Syllabus

🐡 Classical definition of probability. Simple problems on single events (not using set notation).

Chapter Analysis

		2016		20	17	2018
List of Topics	Delhi	Outside	Foreign	Delhi	Outside	Delhi
		Delhi		No.	Delhi	& Outside Delhi
Problems based on tossing a coin		1 Q (3 M)		S		
Problems Based on Throwing a Die	1 Q (3 M)		1 Q (4 M)	1 Q (3 M) 1 Q (4 M)	1 Q (4 M)	1 Q (2 M)
Problems Based on Playing cards	1 Q (1 M)	1 Q (1 M)	1 Q (3 M)			
Problems Based on selection of an object from a Bag/Bon	1 Q (4 M)	1 Q (4 M)	1 Q (1 M)	1 Q (1 M)	1 Q (1 M) 1 Q (3 M)	1 Q (2 M)

Revision Notes

- > Probability is a branch of mathematics that deals with calculating the likelihood of a given event's occurrence.
- A random experiment is an experiment or a process for which the outcome cannot be predicted with certainty.
 (i) tossing a coin, (ii) throwing a dice, (iii) selecting a card.
- Outcome associated with an experiment is called an event. e.g., (i) Getting a head on tossing a coin, (ii) getting a face card when a card is drawn from a pack of 52 cards.
- > The events whose probability is one are called sure/certain events.
- > The events whose probability is zero are called impossible events.
- > An event with only one possible outcome is called an elementary event.
- In a given experiment, if two or more events are equally likely to occur or have equal probabilities, then they are called equally likely events.
- > Probability of an event always lies between 0 and 1.
- Probability can never be negative.
- A pack of playing cards consists of 52 cards which are divided into 4 suits of 13 cards each. Each suit consists of an ace, one king, one queen, one jack and 9 other cards numbered from 2 to 10. Four suits are spades, hearts, diamonds and clubs.
- King, queen and jack are face cards.
- > The sum of the probabilities of all elementary events of an experiment is 1.
- > Two events *A* and *B* are said to be complementary to of each other if the sum of their probabilities is 1.
- Probability of an event *E*, denoted as *P*(*E*), is given by :

$$P(E) = \frac{\text{Number of outcomes favourable to } E}{\text{Total possible number of outcomes}}$$

- For an event E, $P(\overline{E}) = 1 P(E)$, where the event \overline{E} representing 'not E' is the complement of the event E.
- ▶ For *A* and *B* two possible outcomes of an event,

- (i) If P(A) > P(B), then event A is more likely to occur than event B.
- (ii) If P(A) = P(B), then events A and B are equally likely to occur.

Know the Facts

- > The experimental or empirical probability of an event is based on what has actually happened while the theoretical probability of the event attempts to predict what will happen on the basis of certain assumptions.
- > As the number of trials in an experiment go on increasing, we may expect the experimental and theoretical probabilities to be nearly the same.
- > When we speak of a coin, we assume it to be 'fair ' i.e., it is symmetrical so that there is no reason for it to come down more often on one side than the other. We call this property of the coin as being '**unbiased**'.
- > By the phrase 'random toss', we mean that the coin is allowed to fall freely without any bias or interference.
- In the case of experiment we assume that the experiments have equally likely outcomes.
- A deck of playing cards consists of 4 suits : spades (♠), hearts (♥), diamonds (♠) and clubs (♣). Clubs and spades \geq are of black colour, while hearts and diamonds are of red colour.
- The first book on probability 'The Book on Games of Chance' was written by Italian mathematician J. Cardan. ۶
- The classical definition of probability was given by Pierre Simon Laplace.



- (d) 0 (c)
 - **R** [NCERT Exemp.]
- **Sol. Correct option :** (d) Explanation : An event that cannot occur has 0 probability, such an event is called impossible event.
- Q. 2. Which of the following cannot be the probability of an event?
 - (a) (b) 0.1 3

		R
. Correct option : (d)		
Evaluation , Probability	of	2123

- Probability of any event cannot be more than one or negative as $\frac{17}{16} > 1$.
- Q. 3. An event is very unlikely to happen. Its probability is closest to :
 - (a) 0.0001 (b) 0.001 (d) 0.1
 - (c) 0.01

- **Sol. Correct option :** (a)
 - Explanation : The probability of the event, which is very unlikely to happen, will be very close to zero. So it's probability is 0.0001 which is minimum amongst the given values.

U [NCERT Exemp.]

Q. 4. If the probability of an event is *p*, then the probability of its complementary event will be :

(a)
$$p-1$$
 (b) p

(c)
$$1-p$$
 (d) $1-\frac{1}{p}$

U [NCERT Exemp.]

- **Sol. Correct option :** (c) *Explanation :* Probability of an event + Probability of its complementary event = 1
 - $\therefore p$ + Probability of complement = 1
 - Probability of complement = 1 p
- Q. 5. The probability expressed as a percentage of a particular occurrence can never be :
 - (a) less than 100
 - (b) less than 0
 - (c) greater than 1
 - (d) anything but a whole number

U [NCERT Exemp.]

- Sol. Correct option : (b) Explanation : Probability lies between 0 and 1 and when it is converted into percentage it will be between 0 and 100. So, cannot be negative.
- Q. 6. If P(A) denotes the probability of an event A, then :
 - (a) P(A) < 0 (b) P(A) > 1(c) $0 \le P(A) \le 1$ (d) $1 \le P(A) \le 1$
 - (c) $0 \le P(A) \le 1$ (d) $-1 \le P(A) \le 1$
 - U [NCERT Exemp.] [Board Term-2 Set-1, 2013]
- **Sol. Correct option :** (c) *Explanation :* As the probability of an event lies between 0 and 1.
- Q. 7. If a card is selected from a deck of 52 cards, then the probability of its being a red face card is :
 - (a) $\frac{3}{26}$
- (c) $\frac{2}{13}$
- Sol. Correct option : (a)
 - *Explanation :* In a deck of 52 cards, there are 26 red cards.

Number of red face cards = 3 of hearts + 3 of diamonds = 6

So, probability of having a red face card =
$$\frac{6}{52} = \frac{3}{26}$$

- Q. 8. The probability that a non-leap year selected at random will contain 53 Sundays is :
 - (a) $\frac{1}{7}$ (b) $\frac{2}{7}$ (c) $\frac{3}{2}$ (d) $\frac{5}{2}$
 - (c) $\frac{-}{7}$ (d)

Sol. Correct option : (a)

Explanation : Number of days in non-leap year = 365

U [NCERT Exemp.]

Number of weeks =
$$\frac{365}{7} = 52\frac{1}{7} = 52$$
 weeks
Number of days left = 1

For example, it may be any of 7 days which from Sunday, Monday, Tuesday, Wednesday, Thursday, Friday and Saturday; so, T(E) = 7

$$F(E) = 1 \text{ (Sunday)}$$
$$P(F) = \frac{F(E)}{T(E)} = \frac{1}{7}$$

(

Q. 9. When a die is thrown, the probability of getting an odd number less than 3 is :

1

3

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

(c)
$$\frac{1}{2}$$
 (d) 0

U [NCERT Exemp.]

Sol. Correct option : (a) *Explanation :* Total number of outcomes favourable for event E are (1, 2, 3, 4, 5, 6), *i.e.*, T(E) = 6A number which is odd and less than 3 is 1 so, F(E) = 1So, probability $P(E) = \frac{F(E)}{T(E)} = \frac{1}{2}$

Q. 10. A card is drawn from a deck of 52 cards. The event *E* is that card is not an ace of hearts. The number of outcomes favourable to *E* is :

A [NCERT Exemp.]

Sol. Correct option : (d)

Explanation : Favourable event *E* is all cards, except the ace of heart and ace of heart is only one. Hence, the number of outcomes favourable for event *E* is 52 - 1 = 51.

Q. 11. The probability of getting a bad egg in a lot of 400 is 0.035. The number of bad eggs in the lot is :

(a)	7	(b)	14
(c)	21	(d)	28

- 21
- A [NCERT Exemp.]
- Sol. Correct option : (b)

Explanation :

T(E) = 400

Number of outcomes favourable for event *E*, *i.e.*, F(E) =?

$$P(E) = 0.035$$

$$P(E) = \frac{F(E)}{T(E)}$$

$$\Rightarrow 0.035 = \frac{F(E)}{400}$$

So, $F(E) = 0.035 \times 400 = 14$ eggs.

So, the number of bad eggs are 14.

Q. 12. A girl calculates that the probability of her winning the first prize in a lottery is 0.08. If 6,000 tickets are sold, how many tickets has she bought ?

(c) 480 (d) 750

A [NCERT Exemp.]

Sol. Correct option : (c) Explanation : T(E) = 6,000 F(E) = ? P(E) = 0.08 $\therefore P(E) = \frac{F(E)}{T(E)}$ E(E)

$$\Rightarrow 0.08 = \frac{F(L)}{6,000}$$

- \therefore *F*(*E*) = 6000 × 0.08 = 480
- Q. 13. One ticket is drawn at random from a bag containing tickets numbered 1 to 40. The probability that the selected ticket has a number which is a multiple of 5 is :

(a)
$$\frac{1}{5}$$
 (b) $\frac{3}{5}$
(c) $\frac{4}{5}$ (d) $\frac{1}{3}$

A [NCERT Exemp.]

Sol. Correct option : (a)

Explanation :

T(E) = 40

Number of outcomes favourable for event *E* are 5, 10, 15, 20, 25, 30, 35, 40, *i.e.*, *F*(*E*) = 8

$$P(E) = \frac{F(E)}{T(E)} = \frac{8}{40} = \frac{1}{5}$$

Q. 14. Someone is asked to take a number from 1 to 100. The probability that it is a prime is :

(a)
$$\frac{1}{5}$$

(c) $\frac{1}{4}$ (d) $\frac{13}{50}$ [A] [NCERT Exemp.]

25

Sol. Correct option : (c) *Explanation* : T(E) = 100 F(E) prime numbers (2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89 and 97) F(E) = 25P(E) = F(E) = 25 = 1

$$P(E) = \frac{T(E)}{T(E)} = \frac{20}{100} = \frac{1}{4}$$

Q. 15. A school has five houses : *A*, *B*, *C*, *D* and *E*. A class has 23 students, 4 from house *A*, 8 from house *B*, 5 from house *C*, 2 from house *D* and rest from house *E*. A single student is selected at random to be the class monitor. The probability that the selected student is not from *A*, *B* and *C* is :

(a)
$$\frac{4}{23}$$
 (b) $\frac{6}{23}$
(c) $\frac{8}{23}$ (d) $\frac{17}{23}$

A [NCERT Exemp.]

Sol. Correct option : (b) *Explanation :* T(E) = 23

F(E) = Not from A, B, and C = 23 - (4 + 8 + 5)F(E) = 23 - 17 = 6

$$\therefore P(F) = \frac{6}{23}$$

Q. 16. Which of the following cannot be the probability of an event ?

(a)
$$\frac{2}{3}$$
 (b) -1.5

(c) 15% (d) 0.7

Sol. Correct option : (b) *Explanation :* Since the probability of an event *E* is a number P(E) such that $0 \le P(E) \le 1$.

Therefore, -1.5 cannot be the probability of an event. Q. 17. A box contains 90 discs, numbered from 1 to 90. If one disc is drawn at random from the box, the probability that it bears a prime-number less than

$$\begin{array}{c}
23, 18:\\
(a) \quad \frac{7}{90}\\
(c) \quad \frac{4}{45}\\
\end{array}$$
(b) $\frac{10}{90}\\
(d) \quad \frac{9}{89}\\
\end{array}$

Explanation : Total number of outcomes = 90 n(S) = 90

Prime number less than 23 = 2, 3, 5, 7, 11, 13, 17, 19 n (E) = 8

Required probability, $p(E) = \frac{n(E)}{n(S)} = \frac{8}{90} = \frac{4}{45}$.

Q. 18. The probability of getting an even number, when a die is thrown once, is :

(a)	$\frac{1}{2}$	(b) $\frac{1}{3}$
(c)	$\frac{1}{6}$	(d) $\frac{5}{6}$

U [Board comptt. Set-1, 2013]

A [Board Term-2 Set-1, 2013]

Sol. Correct option : (a)

Explanation : Even number = 2, 4, 6

Total outcomes = 1, 2, 3, 4, 5, 6 Required Probability = $\frac{\text{Favourable outcomes}}{\text{Total outcoems}}$

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

Q. 19. In a family of 3 children, the probability of having at least one boy is :

(a)
$$\frac{7}{8}$$
 (b) $\frac{1}{8}$
(c) $\frac{5}{8}$ (d) $\frac{3}{4}$

A [Board, Term-2, Delhi- I, II, III, 2014] Sol. Correct option : (d)

Explanation :

$$S = BBB, GGG, BGG, BBG$$

 $A = BBB, BGG, BBG$
 $n(S) = 4, n(A) = 3$

Q. 20. A number is selected at random from the numbers 1 to 30. The probability that it is a prime number is :

 $p(A) = \frac{n(A)}{n(S)} = \frac{3}{4}.$

(b) (a) 3 $\frac{1}{3}$ (d) (c)

U [Board Term-2 Delhi- I, II, III, 2014]

Sol. Correct option : (c) **Explanation** :

- n(S) = 30A = 2, 3, 5, 7, 11, 13, 17, 19, 23, 29n(A) = 10 $p(A) = \frac{n(A)}{n(S)} = \frac{10}{30} = \frac{1}{3}.$
- Q. 21. The probability that a number selected at random from the numbers 1, 2, 3,, 15 is a multiple of 4, is :

(a)	$\frac{4}{15}$	(b)	$\frac{2}{15}$
(c)	$\frac{1}{5}$	(d)	$\frac{1}{3}$

U [Board Term-2 Outside Delhi-I, II, III, 2014] **Sol. Correct option :** (c)

$$n(S) = 15$$

$$n(A) = 3$$

$$p(A) = \frac{n(A)}{n(S)} = \frac{3}{15} = \frac{1}{5}.$$

Q. 22. Two different coins are tossed simultaneously. The probability of getting at least one head is :

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

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

U [Board Term-2 OD- I, II, III, 2014] Sol. Correct option : (c)

Explanation :

$$S = HH, HT, TH, TT$$

$$A = HH, HT, TH$$

$$n(S) = 4$$

$$n(A) = 3$$

$$\therefore \qquad p(A) = \frac{n(A)}{n(S)} = \frac{3}{4}.$$

- Q. 23. A bag contains cards numbered from 1 to 25. A card is drawn at random from the bag. The probability that the number on this card is divisible by both 2 and 3 is :
 - $\frac{3}{25}$ (a) 5
 - 4 (c) 25

A + U [Board Term-2 Foreign-I, II, III, 2014]

$$n(S) = 25$$

 $n(A) = 4$
 $p(A) = \frac{n(A)}{n(S)} = \frac{4}{25}$

Q. 24. If two different dice are rolled together, the probability of getting an even number on both dice, is :

(a)
$$\frac{1}{36}$$
 (b) $\frac{1}{2}$
(c) $\frac{1}{6}$ (d) $\frac{1}{4}$

U [Board Term-2, Foreign- I, II, III, 2014]

Sol. Correct option : (d) **Explanation** :

Sol.

$$p(A) = 36$$

$$n(A) = 9$$

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

[B] Very Short Answer Type Questions :

Q.1. A die is thrown once. Find the probability of getting "at most 2."

U [CBSE S.A-2 2016 Set HODM40L]

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$$S = \{1, 2, 3, 4, 5, 6\}$$

$$n(S) = 6$$

$$A = \{1, 2\}$$

$$n(A) = 2$$

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

Q. 2. Out of 200 bulbs in a box, 12 bulbs are defective. One bulb is taken out at random from the box. What is the probability that the drawn bulb is not defective ? U [Board Sample paper, 2016]

Sol. Total no. of cases = 200
Favourable cases =
$$200 - 12 = 188$$

 \therefore Required probability = $\frac{188}{200}$
 $= \frac{47}{50}$

Q. 3. A card is drawn at random from a well shuffled pack of 52 cards. Find the probability of getting neither a red card nor a queen.

Number of queens which are not red = 2

Number of red

.:. Cards which are neither red nor queen

$$= 52 - [26 + 2] = 24 \qquad \frac{1}{2}$$

$$\therefore \text{ Required Probability} = \frac{24}{52} = \frac{6}{13} \qquad \frac{1}{2}$$

Q. 4. A letter of English alphabet is chosen at random. Determine the probability that the chosen letter is a consonant.

U [Delhi CBSE Board Term-2, 2015, Set I, II, III]

- Sol. In the English language there are 26 alphabets. Consonants are 21. The probability of choosing a consonant = $\frac{21}{26}$. [CBSE Marking Scheme, 2015] 1
- Q. 5. Cards marked with number 3, 4, 5,, 50 are placed in a box and mixed thoroughly. A card is drawn at random from the box. Find the probability that the selected card bears a perfect U [Delhi Set I, II, III, 2016] square number. **Sol.** Total number of cases = 48

Possible outcomes are 4, 9, 16, 25, 36, 49. 1/2 \therefore No. of favourable outcomes = 6

Thus, *P*(perfect square number) = $\frac{6}{48}$ or $\frac{1}{8}$ $\frac{1}{2}$

- Q. 6. 20 tickets, on which numbers 1 to 20 are written, are mixed thoroughly and then a ticket is drawn at random out of them. Find the probability that the number on the drawn ticket is a multiple of 3 or 7. U [Foreign Set I, II, III, 2016]
- **Sol.** Total number of cases = 20n(s) = 20

$$A =$$
favourable cases = {3, 6, 7, 9, 12, 14, 15, 18}

$$. n(A) = 8$$

 \therefore Required probability = $P(A) = \frac{n(A)}{n(S)} = \frac{8}{20}$

- Q. 7. What is the probability that a non-leap year has 53 U [Board Term-2, 2015] Mondays?
- Sol. There are 365 days in a non-leap year. 365 days = 52 weeks + 1 day

$$\therefore \text{ One day can be } M, T, W, Th, F, S, S = 7 \qquad \frac{1}{2}$$

$$\therefore P(53 \text{ Mondays in non-leap year}) = \frac{-1}{7} \qquad \frac{1}{2}$$

[CBSE Marking Scheme, 2015]

Q. 8. Two different dice are tossed together. Find the probability that the product of the number on the top of the dice is 6.

A [Outside Delhi CBSE Board, 2015, Set I, II, III]

Sol. Product of 6 are (1, 6); (2, 3); (6, 1); (3, 2)
No. of possible outcomes = 4
Total number of chances =
$$6 \times 6 = 36$$

 P (Product = 6) = $\frac{4}{36} = \frac{1}{9}$

[CBSE Marking Scheme, 2015] 1

Q. 9. A game of chance consists of spinning an arrow which comes to rest pointing at one of the numbers 1, 2, 3, 4, 5, 6, 7, 8 and these are equally likely outcomes. Find the probability that the arrow will point at any factor of 8?

U [Foreign Set I, II, III, 2015]

Sol. Total number of points = 8
Since, the factors of 8 are, 1, 2, 4 and 8.
=
$$(1 \times 8), (2 \times 4), (8 \times 1), (4 \times 2)$$

No. of favourable outcomes = 4

No. of favourable outcomes \therefore P(Factors of 8) = 1/2 Total no. of possible outcomes

$$\frac{4}{8} = \frac{1}{2}$$
 ¹/₂

[CBSE Marking Scheme, 2015]

Q. 10. If E be an event such that $P(E) = \frac{3}{7}$, what is P(not E)

- **R** [Delhi CBSE Board Term-2, 2014] $P(E) = \frac{3}{7}$ equal to ? Sol. :: $P(\operatorname{not} E) = 1 - P(E)$ • 1
- Q. 11. Find the probability of an impossible event.

Sol. P(impossible event) = 0

- Q. 12. A bag contains cards numbered from 1 to 25. A card is drawn at random from the bag. Find the probability that number is divisible by both 2 and 3. U [Foreign Set I, II, III, 2014]
 - **Sol.** The numbers divisible by 2 and 3 both = 6, 12, 18,and 24.

No. of favourable outcomes = 4.

...

$$P(\text{number divisible by 2 and 3}) = \frac{4}{25}$$
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Q. 13. A number is selected at random from 1 to 30. Find the probability that it is a prime number.

U [Delhi CBSE, 2014]

Sol. Prime numbers form 1 to 30 are = 2, 3, 5, 7, 11, 13, 17, 19, 23 and 29,

No. of favourable outcomes =
$$10$$
 ¹/₂
No. of possible outcomes = 30

$$P(\text{prime no.}) = \frac{10}{30} = \frac{1}{3}$$
 ¹/₂

Q. 14. A box contains 90 discs, numbered from 1 to 90. If one disc is drawn at random from box, find the probability that it bears a prime number less than 23. **U** [Board Term-2 2012, Set 2023]

Sol. No. of possible outcomes = 90Prime numbers less than 23 = 2, 3, 5, 7, 11, 13, 17, 19 No. of favourable outcomes = 8 $\frac{1}{2}$

$$P(\text{prime no. less than 23}) = \frac{8}{90} = \frac{4}{45}$$
 ¹/₂

Q. 15. If P(E) = 0.20, then what is the probability of 'not E' ? **R** [Board Term, 2012, Set (22)]

Sol.

$$P(E) = 0.20$$

 $P(not E) = 1 - P(E)$
 $= 1 - 0.20$
 $= 0.80$ 1
[CBSE Marking Scheme, 2012]

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Q. 16. From the number 3, 5, 5, 7, 7, 7, 9, 9, 9, 9, 9, one number is selected at random, what is the probability that the selected number is mean ?

U [Board Term-2, 2012 Set (50)]

I. Total outcomes = 10
Mean =
$$\frac{3+5+5+7+7+7+9+9+9+9}{10} = \frac{70}{10} = 7$$

No. of favourable outcomes = 3

$$P(\text{mean}) = \frac{3}{10} \qquad \qquad 1$$

[CBSE Marking Scheme, 2012]

Q. 17. A die is thrown once. Find the probability of getting a prime number.

U [Board Term-2, 2012 Set (12)]

Sol. Total number of outcomes = 6

Prime numbers
$$= 2, 3, 5,$$

No. of favourable outcomes
$$= 3$$

$$P(\text{prime no.}) = \frac{3}{6} = \frac{1}{2}$$
 1

[CBSE Marking Scheme, 2012]

Q. 18. A girl calculates the probability of her winning the game in a match and find it 0.08. What is the probability of her losing the game ?

- **Sol.** *P*(winning the game) = 0.08 *P*(losing the game) = 1 – 0.08 = 0.92 [CBSE Marking Scheme, 2012]
- Q. 19. The probability of getting a bad egg in a lot of 400 eggs is 0.035. Find the number of bad eggs in the lot.
- Sol. Here, P(bad eggs) = 0.035 $P(\text{bad eggs}) = \frac{\text{No. of bad eggs}}{\text{Total no. of eggs}}$ $0.035 = \frac{\text{No. of bad eggs}}{400}$
 - $\therefore \qquad \text{No. of bad eggs} = 400 \times 0.035$ = 14

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Q. 20. A bag contains lemon flavoured candies only. Shalini takes out one candy without looking into the bag. What is the probability that she takes out an orange flavoured candy ?

R [Board Term-2, 2012 Set (17)]

Sol : Bag contains only lemon flavoured candies. So, getting an orange flavoured candy is impposible

Q. 21. In tossing a die, what is the probability of getting an odd number or number less than 4 ?

U [Board Term-2, 2012 Set (33)]

Sol. Odd numbers = 1, 3, 5,
Numbers less than
$$4 = 1, 2, 3$$
,
 \therefore No. of favour outcomes = 4

:.
$$P(\text{an odd no. or a no.} < 4) = \frac{4}{6} = \frac{2}{3}$$
 1

[CBSE Marking Scheme, 2012]

Q. 22. A card is drawn from a well shuffled deck of playing cards. Find the probability of drawing a red face card.

Sol. Total possible outcomes =
$$52$$

No. of red face cards = 6

$$P(\text{red face card}) = \frac{6}{52} = \frac{3}{26}$$
 1

[CBSE Marking Scheme, 2012]

Q. 23. Find the probability of getting a sum of 9, when two dice are thrown simultaneously.

U [Board Term-2, 2012 Set (34)]

Total possible outcomes =
$$6 \times 6 = 36$$

4

$$P(E) = \frac{4}{36} = \frac{1}{9} \qquad \frac{1}{2}$$

[CBSE Marking Scheme, 2012]

Q. 24. Can 1.1 be probability of an event ?

R [Board Term-2, 2012 Set (52)]

- Sol. No. Since the probability of an event cannot be more than 1. [CBSE Marking Scheme, 2012] 1
- Q. 25. A bag contains 3 red and 5 black balls. A ball is drawn at random from the bag. What is the probability that the drawn ball is not red ?

R [Delhi Set-I, II, III 2017]

Sol. Number of balls in the bag = $3 + 5 = 8$	1/2
P(that the drawn ball is not red) = 5	1/

$$f(\text{that the drown ball is not red}) = \frac{-}{8}$$
.

[CBSE Marking Scheme, 2017]

Q. 26. If three different coins are tossed togather, then find the probability of getting two heads.

R [Outside Delhi Compt. Set-I, II, III 2017]

Sol. All possible outcomes are : (HHH), (THH), (HTH), (HHT), (TTT), (TTH), (THT), (HTT). No. of favourable outcomes = 3

...

$$P(\text{getting two heads}) = \frac{3}{8}$$
 1

[CBSE Marking Scheme, 2017]

Q. 27. A number is chosen at random from the numbers - 3, - 2, - 1, 0, 1, 2, 3. What will be the probability that square of this number is less than or equal to 1.

So

Q. 28. The probability of selecting a rotten apple randomly from a heap of 900 apples is 0.18. What is the number of rotten apples in the heap ?



[C] Fill in the Blanks :

Q. 1. Complete the following statements :

- (a) Probability of event E + Probability of event 'not E' = _____.
- (b) The probability of an event that cannot happen is ______. Such an event is called _____.
- (c) The probability of an event that is certain to happen is _____. Such an event is called
- (d) The sum of the probabilities of all the elementary events of an experiment is ______.
- (e) The probability of an event is greater than or equal to ______ and less than or equal to ______.

U [NCERT Exemp.]

- (a) 1(b) 0; impossible event
- (c) 1; sure of curtain event
- (**d**) 1
- (e) 0; 1

÷.

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Short Answer Type Questions-I

(2 marks each)

Q. 1. A bag contains cards with numbers written on it from 1 - 80. A card is pulled out at random. Find the probability that the card shows a perfect square.

 $S = \{1, 2\}$

n(A) = 8

Sol.

$$n(S) = 80$$
 ¹/₂

$$A = \{1, 4, 9, 16, 25, 36, 49, 64\}$$

U [CBSE S.A.-2 2016 Set HODM4OL]

803

$$P(A) = \frac{n(A)}{n(S)} = \frac{8}{80}$$
$$= \frac{1}{10}$$
1

Q. 2. A bag contains 6 red and 5 blue balls. Find the probability that the ball drawn is not red.

U [Delhi CBSE Term-2, 2015 Set 1]

Sol. No. of possible outcomes = 6 + 5

= 11 1 No. of favourable outcomes = 5

$$\therefore \qquad P(\text{not red}) = \frac{5}{11} \qquad 1$$

Q. 3. There are 30 cards of the same size in a bag in which the numbers 1 to 30 are written. One card is taken out of the bag at random. Find the probability that the number on the selected card is not divisible by 3. C + A [Foreign Set I, 2014] [Board Term-2, 2012 Set(21)]

Sol. Total cards = 30 Number divisible by 3 = 3, 6, 9, 12, 15, 18, 21, 24, 27, 30 Total number of favourable outcomes = 30 – 10

$$= 20 \quad 1$$

Required probability
$$= \frac{20}{30} = \frac{2}{3}$$

(2 marl

- Q. 4. Two different dice are tossed together. Find the probability.
- (i) that the number on each die is even.
- (ii) that the sum of numbers appearing on the two dice is 5. C + A [CBSE O.D. 2014]
- **Sol. (i)** Even numbers occur is (2, 2) (2, 4) (2, 6) (4, 2) (4, 4) (4, 6) (6, 2) (6, 4) (6, 6)

P (number of each die is even) =
$$\frac{9}{36} = \frac{1}{4}$$
 1

(ii) Sum of numbers is 5 in (1, 4) (2, 3) (3, 2) (4, 1)

- *P* (sum of numbers appearing on two dice is 5) $= \frac{4}{36} = \frac{1}{9} \cdot \mathbf{1}$
- Q. 5. A letter of English alphabet is chosen at random, find the probability that the letter so chosen is :(i) a vowel,
 - (ii) a consonant. A [Delhi CBSE, Term-2, 2014] [Board Term-2, 2012 Set (12)]
- **Sol.** Since, total number in english alphabet is 26. in which 5 vowels and 21 consonants.

(i)
$$P$$
 (a vowel) = $\frac{5}{26}$

(ii) P (a consonant) = $\frac{21}{26}$

[CBSE Marking Scheme, 2012] 1

Q. 6. Harpreet tosses two different coins simultaneously. What is the probability that she gets :

(i) atleast one head ?

(ii) one head and one tail ? [Delhi CBSE, Term-2, 2014; Foreign set I, 2014(Sec-A)]

A [Board Term-2, 2012 Set (17)]

(i) $P(E_1) = \frac{5}{4}$ 1 (ii) $P(E_2) = \frac{2}{4} = \frac{1}{2}$ 1

[CBSE Marking Scheme, 2012]

Q. 7. A bag contains cards bearing numbers from 11 to 30. A card is taken out from the bag at random. Find the probability that the selected card has multiple of 5 on it.

> C + U [Delhi CBSE, Term-2, 2014] [Board Term-2, 2012 Set (59)]

Sol.No. of cards =
$$20$$
 $\frac{1}{2}$ Multiples of 5 from 11 to 30 are 15, 20, 25, 30Number of favourable outcomes = 4 1

$$\therefore \quad \text{Required probability} = \frac{4}{20} = \frac{1}{5} \qquad \frac{1}{2}$$

[CBSE Marking Scheme, 2012]

Q. 8. A bag contains 5 red, 8 green and 7 white balls. One ball is drawn at random from the bag, find the probability of getting : (i) not a white ball,

S

1

(ii) neither a green nor a red ball.

C + A [Delhi CBSE Term-2, 2014] [Board Term-2, 2012 Set (40)]

(i) Total balls =
$$5 + 8 + 7 = 20$$

 $P(\text{white ball}) = \frac{7}{20}$

$$P(\text{not a white ball}) = 1 - \frac{7}{20} = \frac{13}{20}$$
 1

(ii)
$$P(\text{green or red}) = \frac{8+5}{20} = \frac{13}{20}$$

 $P(\text{neither green nor red}) = 1 - \frac{13}{20}$

[CBSE Marking Scheme, 2012]

- Q. 9. Two dice are rolled simultaneously. Find the probability that the sum of numbers appearing is 10.
 Image: Sol. When two dice are thrown, no. of all Possible
 - outcomes = $6 \times 6 = 36$ 1 Since, sum of both faces should be 10, they are,

$$\{(4, 6), (6, 4), (5, 5)\}$$

÷.

. No. of favourable outcomes = 3

$$P(E) = \frac{3}{36} = \frac{1}{12}$$
 1

Q. 10. A bag contains 3 red, 4 green and 5 white candles, one candle is drawn at random from the bag, find the probability that candle is not red.

U [Board Term-2 2014]

- **Sol.** Try yourself similar to Q. 9, SATQ I.
- Q. 11. In a family of two children find the probability of having atleast one girl.

U [Board Term-2, 2012 Set (12, 24)]

Sol. The possible outcomes are, GG, GB, BG, BB **1** Favourable outcomes = GG, GB, BG = 3

Probability of atleast one girl =
$$\frac{3}{4}$$
 1

[CBSE Marking Scheme, 2012]

- Q. 12. Find the probability that a leap year has 53 sundays.
 - **Sol.** 366 days = 52 weeks + 2 days ¹/₂ 2 days can be MT, TW, WTh, ThF, FS, SS, SM = 7 ¹/₂

$$\Rightarrow \quad P(\text{of leap year}) = \frac{2}{7} \qquad 1$$

[CBSE Marking Scheme, 2012]

- Q. 13. Two dice, one blue and one grey, are thrown at the same time. What is the probability that the sum of the two numbers appearing on the top of the dice is 8? C + U [Board Term-2, 2012 (5)]
- **Sol.** Try yourself similar to Q. 9, SATQ I.
- Q. 14. A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball from the bag

....

Sol.

is thrice that of the red ball, find the number of blue balls in the bag.

C + A [Board Term-2, 2012 Set (31)] [Board Term-2, 2012 Set (5)]

Sol. Let blue balls = x and red balls = 5 Total balls = 5 + x $P(\text{red ball}) = \frac{5}{5+3}$ $P(\text{blue ball}) = \frac{x}{-}$ 1

$$\frac{x}{5+x} = 3\frac{5}{5+x} \Rightarrow x = 15$$

[CBSE Marking Scheme, 2012]

- Q. 15. One card is drawn from a well shuffled deck of 52 cards. Find the probability of getting :
 - (i) a non-face card,
 - (ii) a black king. A [Board Term-2, 2012 (40)]

(i) Face cards = 12

$$\therefore$$
 No. of non-face cards = $52 - 12 = 40$
 $40 - 10$

$$P(\text{non-face}) = \frac{1}{52} = \frac{1}{13}$$

(ii) No. of black kings = 2

$$P(\text{black king}) = \frac{2}{52} = \frac{1}{26}$$

[CBSE Marking Scheme, 2012]

1

1

O. 16. Two dice are thrown together. What is the probability of getting a doublet ? ι

Sol. Total number of possible outcomes $= 6^2 = 36$ 1/2 *E* : (doublets are (1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6) No. of favourable outcomes to E = 61/2 \therefore *P*(a doublet)

_ Number of outcomes favourable to E Total number of outcomes

$$=\frac{6}{36}=\frac{1}{6}$$
 1

[CBSE Marking Scheme, 2012]

- Q. 17. A lot consists of 144 ball pens of which 20 are defective and others are good. Nuri will buy a pen if it is good, but will not buy if it is defective. The shopkeeper draws one pen at random and gives it to her. What is the probability that :
 - (i) she will buy it ?
 - (ii) she will not buy it?

Sol. Total no. of pens =
$$144$$

Defective one = 20
Good ones = $144 - 20 =$

Probability of purchasing pen =
$$\frac{124}{144} = \frac{31}{36}$$
 1

Probability of not purchasing pen = 1 144 =

[CBSE Marking Scheme, 2012]

= 124

Q. 18. Two different dice are thrown together. Find the probability that the product of the number appeared is less than 18.

U [Foreign Set -I, II, III 2017]

Sol. No. of all possible outcomes $= 6^2 = 36$	
No. of favourable outcomes $= 26$	$\frac{1}{2}$
(4, 2)(4, 3)(4, 5)(4, 4)(5, 1)(5, 2)(5, 3)(6, 1)(6, 2)(1	, 1)
(1, 2)(1, 3)(1, 4)(1, 5)(1, 6)(2, 1)(2, 2)(2, 3)(2, 4)(2, 5)(2, 3)(2, 4)(2, 5)(2, 3)(2, 4)(2, 5)(2, 3)(2, 4)(2, 5)(2, 3)(2, 4)(2, 5)(2,	5)(2,
6) (3, 1)(3, 2)(3, 3)(3, 4)(3, 5)(4, 1)	
$\therefore P(\text{Product appears in less than } 18) = \frac{26}{36} = \frac{13}{18}$	1½

[CBSE Marking Scheme, 2017]

- Q. 19. A box contains cards numbered 11 to 123. A card is drawn at random from the box. Find the probability that the number of the drawn card is
 - (i) A perfect Square number
 - (ii) A multiple of 7.

C + U [Sample Question Paper 2017]

- Sol. No. of all possible outcomes = 113
- (i) Perfect square numbers between 11 to 123 are 16, 25, 36, 49, 64, 81, 100 and 121.
 - No. of all favourable outcomes = 8

P(Number drawn is perfect square) =
$$\frac{8}{113}$$
 1

(ii) No. of multiples of 7 from 11 to 123 = 16. i.e., 14, 21, 28, 35, 42, 49, 56, 63, 70, 77, 84, 91, 98, 105, 112 and 119

$$\therefore P(\text{number drawn card is multiple of 7}) = \frac{16}{113} \quad 1$$

Q. 20. A box contains 12 balls of which some are red in colour. If 6 more red balls are put in the box and a ball is drawn at random the probability of drawing a red ball doubles than what it was before. Find the number of red balls in the bag.

C + U [Sample Question Paper 2017]

Sol. Let red balls in the box be *x*

Total number of balls = 12

P(getting a red ball) =
$$\frac{x}{12}$$

On putting 6 red balls in the bag

Total numbers of balls = 12 + 6 = 18

No. of red balls
$$= x + 6$$

Probability =
$$\frac{x+6}{18}$$
 1

1

According to the problem,

$$2 \times \frac{x}{12} = \frac{x+6}{18}$$
$$18x = 6x + 36$$
$$x = 3$$
the new of and helis = 2

Hence, the no. of red balls = 3.

- Q. 21. An integer is chosen at random between 1 and 100. Find the probability that it is :
 - (i) divisible by 8.

 \Rightarrow

 \Rightarrow

(ii) not divisible by 8. U [CBSE Delhi/OD Set-2018]

- (i) Favourable outcomes are 8, 16, 24, ..., 96, *i.e.*, 12 ¹/₂ Probability (integer is divisible by 8) = $\frac{12}{98}$ or $\frac{6}{49}$ 1
- (ii) Probability (integer is not divisible by 8) = $1 \frac{6}{49}$

$$=\frac{43}{49}$$
 $\frac{1}{2}$

1

[CBSE Marking Scheme, 2018]

Q. 22. A card is drawn at random from a well shuffled deck of 52 cards. Find the probability of getting neither a red card nor a queen.

U [CBSE SQP-2018-19]

Sol. Probability of either a red card or a queen

$$\frac{1+2}{52} = \frac{28}{52}$$

 $P(\text{neither red card nor a queen}) = 1 - \frac{28}{52}$

$$= \frac{52-28}{52} = \frac{24}{52} = \frac{6}{13} \qquad 1$$

[CBSE Marking Scheme, 2018-19]

- Q. 23. Two dice are thrown at the same time and the product of numbers appearing on them is noted. Find the probability that the product is a prime number.
 U [CBSE SQP-2018-19]
- **Sol.** Total number of outcomes = 36 1
 - Favourable outcomes are (1, 2), (2, 1), (1, 3), (3, 1), (1, 5), (5, 1) *i.e.*, 6

Required probability =
$$\frac{6}{36}$$
 or $\frac{1}{6}$ 1

[CBSE Marking Scheme, 2018-19]

(3 marks each)

Q. 24. A group consists of 12 persons, of which 3 are extremely patient, other 6 are extremely honest and rest are extremely kind. A person from the group is selected at random. Assuming that each person is equally likely to be selected, find the probability of selecting a person who is (i) extremely patient, (ii) extremely kind or honest. AE [Delhi 2013]

Sol. (i) *P* (extremely patient)
$$= \frac{3}{12} = \frac{1}{4}$$
 1

(ii) *P* (extremely kind or honest)
$$= \frac{6+3}{12} = \frac{9}{12} = \frac{3}{4}$$
 1

Short Answer Type Questions-II

Q. 1. From a pack of 52 playing cards, Jacks, Queens and Kings of red colour are removed. From the remaining, a card is drawn at random. Find the probability that drawn card is : [Outside Delhi, 2015 O.D. Set-II, 2016]
(i) a black king, (ii) a card of red colour, (iii) a card of black colour.

Sol. Jotal cards = 5.2
Cards vernoud: 6
Card left + 52-6 = 46
- Jotal black king = 2.
Probability of drawing black king =
$$\frac{2}{4.6} = \frac{1}{2.3}$$

Jotal red card = 26-6.
= 20
Probability of drawing red colour card = $20 = \frac{10}{4.6} = \frac{10}{2.3}$
Jotal card of black colour = 26
Probability of drawing black colour card = $26 = \frac{13}{4.6} = \frac{13}{2.3}$
Topper Answer, 2016] 3

Q. 2. A bag contains cards numbered 1 to 49. Find the probability that the number on the drawn card is :

(i) an odd number

(ii) a multiple of 5

(iii) Even prime C + A [Delhi CBSE, Term-2, 2014]

Sol. Total cards = 49Odd numbers from 1 to 49 are 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47 and 49. No. of favourable outcomes = 25 $P(\text{odd number}) = \frac{25}{49}$ (i) 1 Multiple of 5 are 5, 10, 15, 20, 25, 30, 35, 40 and 45. No. of favourable outcomes = 9 $P(\text{multiple of 5}) = \frac{9}{49}$ (ii) 1 Only even prime number is 2 *i.e.*, *P*(even prime) $P(\text{even prime}) = \frac{1}{49}$ (iii) 1 Q. 3. Two unbiased coins are tossed simultaneously. Find the probability of getting : (i) atleast one head, (ii) atmost one head, (iii) no head. A [Delhi CBSE, Term-2, 2014] [Board Term-2, 2012 Set (13)] **Sol. (i)** *P* (at least one head) = $\frac{3}{4}$ $S = \{HH, HT, TH, TT\} \text{ (optional)}$ (ii) *P* (at most one head) = $\frac{3}{4}$ 1 (iii) P (no head) = $\frac{1}{4}$ [CBSE Marking Scheme, 2012] 1 Q. 4. Three different coins are tossed together. Find the probability of getting (i) exactly two heads. (ii) at least two heads U [O.D. Set I, 2016] (iii) at least two tails. Sol. Possible outcomes are {HHH, HHT, HTH, THH, HTT, THT, TTH, TTT} u(C) = 0

(i) Exactly two heads = {HHT, HTH, THH}

$$n(P_1) = 3$$

 \therefore $P_1 = \frac{n(P_1)}{n(S)} = \frac{3}{8}$

(ii) At least two heads {*HHT*, *HTH*, *THH*, *HHH*} $n(P_2) = 4$

$$P_2 = \frac{n(P_2)}{n(S)} = \frac{4}{8} = \frac{1}{2}$$
 1

1

(iii) At least two tails {*TTH*, *THT*, *HTT*, *TTT*}

$$n(P_3) = 4$$

 $P_3 = \frac{n(P_3)}{n(S)} = \frac{4}{8} = \frac{1}{2}$
1

Q. 5. A game consists of tossing a one-rupee coin 3 times and noting the outcome each time. Ramesh will win the game if all the tosses show the same result, (*i.e.* either all three heads or all three tails) and loses the game otherwise. Find the probability that Ramesh will lose the game

C + **A** [Foreign Set I, 2016]

Sol. Total outcomes are {*HHH*, *HHT*, *HTH*, *THH*, *HTT*, *THT*, *TTH*, *TTT*} No. of total outcomes = 8 Same result on all the tosses (*A*) = *HHH*, *TTT*, **1** No. of favourable outcomes = 2 **1** \therefore P (Ramesh will lose the game) = $\frac{8-2}{8} = \frac{6}{8} = \frac{3}{4}$ **1**

[CBSE Marking Scheme, 2016]

Q. 6. In a single throw of a pair of different dice, what is the probability of getting (i) a prime number on each dice ? (ii) a total of 9 or 11 ?

U [Delhi Set I, 2016]

Sol. (i) Favourable outcomes are (2, 2) (2, 3) (2, 5) (3, 2) (3, 3) (3, 5) (5, 2) (5, 3) (5, 5) *i.e.* 9 outcomes. 1

P (a prime number on each die) =
$$\frac{9}{36}$$
 or $\frac{1}{4}$ ¹/₂

(ii) Favourable outcomes are (3, 6) (4, 5) (5, 4) (6, 3) (5, 6) (6, 5) *i.e.* 6 outcomes **1**

P (a total of 9 or 11) =
$$\frac{6}{36}$$
 or $\frac{1}{6}$ ^{1/2}

[CBSE Marking Scheme, 2016]

- Q. 7. A box consists of 100 shirts of which 88 are good, 8 have minor defects and 4 have major defects.
 Ramesh, a shopkeeper will buy only those shirts which are good but 'Kewal' another shopkeeper will not buy shirts with major defects. A shirt is taken out of the box at random. What is the probability that :
 - (i) Ramesh will buy the selected shirt ?
 - (ii) 'Kewal' will buy the selected shirt ?

C + A [Delhi Set III, 2016]

- Sol. (i) Number of good shirts = 88 1 P (Ramesh buys the shirt) = $\frac{88}{100}$ or $\frac{22}{25}$ ¹/₂
 - (ii) Number of shirts without major defect = 96 1

$$P$$
 (Kewal buys a shirt) = $\frac{96}{100}$ or $\frac{24}{25}$ $\frac{1}{25}$

[CBSE Marking Scheme, 2016]

- Q. 8. A box contains 100 cards marked from 1 to 100. If one card is drawn at random from the box, find the probability that it bears :
 - (i) a single digit number

...

- (ii) a number which is a perfect square
- (iii) a number which is divisible by 7

$$\overline{C}$$
 + \overline{A} [CBSE S.A.-2 2016 HODM4OL]

- Sol. (i) No. of favourable outcomes = 9 No. of all possible outcomes = 100 $P(\text{Single digit number}) = \frac{9}{100}$ 1
- (ii) Perfect square numbers from 1 to 100 are 1, 4, 9, 16, 25, 36, 49, 64, 81 and 100

No. of favourable outcomes = 10

P(Perfect square) =
$$\frac{10}{100} = \frac{1}{10}$$
 1

(iii) Numbers divisible by 7 are 7, 14, 21, 28, 35, 42, 49, 56, 63, 70, 77, 84, 91 and 98

No. of favourable outcomes = 14

:.
$$P(a \text{ number divisible by 7}) = \frac{14}{100} = \frac{7}{50} 1$$

- Q. 9. There are 100 cards in a bag on which numbers from 1 to 100 are written. A card is taken out from the bag at random. Find the probability that the number on the selected card
 - (i) is divisible by 9 and is a perfect square.
- (ii) is a prime number greater than 80.
- C + A [O.D. Set III, 2016] Sol. Total outcomes are = 1, 2, 3 ... 99, 100 No. of total outcomes = 100n(s) = 1001/2

(i) Number divisible by 9 and perfect square are 9, 36 and 81.

No. of favourable outcomes = 3
$$\frac{1}{2}$$

$$\therefore \quad \text{Required probability} = \frac{3}{100} \qquad \qquad 1$$

(ii) Prime numbers greater than 80 and less than 100 are 83, 89 and 97.

No. of favourable outcomes = 3

$$\therefore \quad \text{Required probability} = \frac{3}{100} \qquad \qquad 1$$

- Q. 10. Cards numbered 2 to 101 are placed in a box. A card is selected at random from the box, find the probability that the card selected :
 - (i) has a number which is a perfect square.
 - (ii) has an odd number which is not less than 70.

A [Board Term-2, 2012 Set (40)]

Sol. Try yourself similar to Q. 9. SATQ- II.

- Q. 11. All red face cards are removed from a pack of playing cards. The remaining cards are well shuffled and then a card is drawn at random from them. Find the probability that the drawn card is : (i) a red card
 - (ii) a face card
 - (iii) a card of clubs

C + A [Delhi CBSE Board Term-2, 2015 Set III] Sol. Try yourself similar to Q. 1. SATQ- II.

Q. 12. The probability of selecting a red ball at random from a jar that contains only red, blue and orange balls is $\frac{1}{4}$. The probability of selecting a blue

balls at random from the same jar is $\frac{1}{3}$. If the jar

contains 10 orange balls, find the total number of ball in the jar. C + A Outside Delhi CBSE Board Term-2, 2015, Set I, II]

Sol.
$$P(\text{red ball}) = \frac{1}{4}$$
 and $P(\text{blue ball}) = \frac{1}{3}$ ¹/₂

$$\Rightarrow P(\text{orange ball}) = 1 - \left(\frac{1}{4} + \frac{1}{3}\right) = \frac{5}{12}$$

$$\Rightarrow \frac{5}{12} \text{ of (Total no. of balls)} = 10 \qquad \frac{1}{2}$$

$$\Rightarrow$$
 Total numbers of balls = $\frac{10 \times 12}{5} = 24$. 1

[CBSE Marking Scheme, 2015]

- Q. 13. Two different dice are thrown together. Find the probability of :
 - (i) getting a number greater than 3 on each die.
 - (ii) getting a total of 6 or 7 of the numbers on two dice. C + A [Delhi Set II, 2016]

- Sol. (i) Favourable outcomes are (4, 5) (4, 4) (4, 6) (5, 4) (5, 5) (5, 6) (6, 4) (6, 5) (6, 6) 1 \therefore No. of favourable outcomes = 9 $P(a \text{ number} > 3 \text{ on each die}) = \frac{9}{36} \text{ or } \frac{1}{4}$ $\frac{1}{2}$
- (ii) Favourable outcomes are (1, 5) (2, 4) (3, 3) (4, 2) (5, 1) (1, 6) (2, 5) (3, 4) (4, 3) (5, 2) (6, 1)∴ No

b. of favourable outcomes
$$= 11$$

$$P \text{ (a total of 6 or 7)} = \frac{11}{36}$$
. $\frac{1}{2}$

CBSE Marking Scheme, 2016

Q. 14. One card is drawn from a well shuffled deck of 52 cards. Find the probability of getting (a) Non face card, (b) Black king or a Red queen, (c) Spade card. 🗙 C + A [Board Sample Paper 2016]

Sol. (a) Total number of cards = 52
Number of non face cards = 52 - 12
= 40
P(non-face cards) =
$$\frac{40}{52} = \frac{10}{13}$$
 1

P(a black Kind or a red queen) =
$$\frac{4}{52} = \frac{1}{13}$$
 1

Number of spade cards = 13

$$P$$
 (Spade cards) = $\frac{13}{52} = \frac{1}{4}$ 1

[CBSE Marking Scheme, 2016]

- Q. 15. Three coins are tossed simultaneously once. Find the probability of getting :
 - (i) atleast one tail,

F

(c)

Sol. Possible outcomes are HHH, HTH, HHT, HH, TTH, THT, HTT, TTT 1 (i) No. of favourable outcomes = 7

$$P(\text{atleast one tail}) = \frac{7}{8}$$
 1

(ii) No. of favourable outcomes = 1

$$o tail) = \frac{1}{8}$$
 1

[CBSE Marking Scheme, 2012]

Q. 16. A game consists of tossing a one-rupee coin three times and noting its outcome each time. Find the probability of getting :

P(n

- (i) three heads,
- (ii) at least two tails. A [Foreign Set II, 2015]

Sol. Total number of outcomes = $2^3 = 8$ 1 (i) P (three heads) = $\frac{1}{8}$ 1 (ii) P (atleast two tails) = $\frac{4}{8} = \frac{1}{2}$ 1 [CBSE Marking Scheme, 2015] Q. 17. One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting :

- cards. Find the probability of getting : (i) a red face card,
- (ii) a spade,
- (iii) either a king or a black cards.

A [Delhi CBSE Board Term-2, 2015] [Board Term-2, 2012 Set (17)]

Sol. Total outcomes = 52

(i) No. of red face cards = 6

$$P(E_1) = \frac{6}{52} = \frac{3}{26}$$
 1

(ii) No. of spade cards = 13

$$P(\mathbf{E}_2) = \frac{13}{52} = \frac{1}{4}$$
 1

(iii) No. of favourable outcomes = 4 + 24 = 28

$$P(E_3) = \frac{28}{52} = \frac{7}{13}$$
 1

[CBSE Marking Scheme, 2012]

- Q. 18. Three unbiased coins are tossed together. Find the probability of getting :
 - (i) atleast two heads,
 - (ii) atmost two heads.

A [Delhi CBSE Board Term-2, 2015, Set II] [Board Term-2, 2012 (21)]

Sol. Total possible outcomes are (*H*, *H*, *H*), (*H*, *H*, *T*) (*H*, *T*, *H*), (*T*, *H*, *H*) (*T*, *H*, *T*), (*T*, *T*, *H*), (*T*, *T*, *T*), (*H*, *T*, *T*) 1

The total number of possible outcomes = 8

(i) For atleast 2 heads favourable outcomes are = (H, H, H), (H, H, T), (H, T, H), (T, H, H)

$$P \text{ (at least 2 heads)} = \frac{4}{8} = \frac{1}{2} \qquad 1$$

(ii) For atmost 2 heads the favourable outcomes are = (H, H, T), (H, T, H), (T, T, T), (T, H, H), (T, H, T), (T, T, H), (H, T, T)

$$\therefore P(\text{atmost two heads}) = \frac{7}{8}$$
 1

[CBSE Marking Scheme, 2012]

Q. 19. A bag contains, white, black and red balls only. A ball is drawn at random from the bag. If the probability of getting a white ball is $\frac{3}{10}$ and that

of a black ball is $\frac{2}{5}$, then find the probability of

getting a red ball. If the bag contains 20 black balls, then find the total number of balls in the bag.

> C + U [Outside Delhi CBSE Board Term-2, 2015, Set III]

Sol. P (White ball) =
$$\frac{3}{10}$$
 and P (Black ball) = $\frac{2}{5}$;

$$P(\text{Red ball}) = 1 - \left(\frac{5}{10} + \frac{2}{5}\right) = \frac{5}{10} + \frac{1}{2}$$

$$\frac{2}{5}$$
 of (Total no. of balls) = 20 $\frac{1}{2}$

$$\Rightarrow \text{ Total numbers of balls} = \frac{20 \times 5}{2} = 50 \qquad 1$$

[CBSE Marking Scheme, 2015]

- Q. 20. A bag contains 18 balls out of which x balls are red.(i) If one ball is drawn at random from the bag, what is the probability that it is not red ?
 - (ii) If 2 more red balls are put in the bag, the probability of drawing a red ball will be $\frac{9}{8}$ times the probability of drawing a red ball in the first case. Find the value of *x*.

$$P(\text{red ball}) = \frac{x}{18}$$

Sol

(i)
$$P(\text{no red ball}) = 1 - \frac{x}{18} = \frac{18 - x}{18}$$
 1

(ii) Total number of balls = 18 + 2 = 20

$$P(\text{red balls}) = \frac{x+2}{20}$$
 $\frac{1}{2}$

Now, According to the question,

$$\frac{x+2}{20} = \frac{9}{8} \times \frac{x}{18}$$

$$\Rightarrow \qquad 180x = 144x + 288$$

$$\Rightarrow \qquad 36x = 288$$

$$\Rightarrow \qquad x = \frac{288}{36} = 8 \qquad 1\frac{1}{2}$$

[CBSE Marking Scheme, 2015]

- Q. 21. Cards numbered 1 to 30 are put in a bag. A card is drawn at random. Find the probability that the drawn card is
 - (i) prime number > 7
 - (ii) not a perfect square A [Delhi CBSE, Term-2, 2014]
 - Sol. The possible outcomes are

 $1, 2, 3, 4, \dots, 30 = 30$

Total No. of possible outcomes = 30

(i) Prime number greater the 7 and less than 30 are :

11, 13, 17, 19, 23, 29

No. of favourable outcomes = 6

$$P(\text{prime no.} > 7) = \frac{6}{30} = \frac{1}{5}$$
 1¹/₂

(ii) Perfect square numbers are :

1, 4, 9, 16, 25

- No. of perfect square numbers = 5
- No. of non-perfect square numbers = 30 5

$$= 25$$

25 5

 \therefore P(non-perfect square numbers) = $\frac{25}{30} = \frac{5}{6}$ 1¹/₂

- O. 22. Two dice are thrown at the same time. Find the probability of getting :
 - (i) same number on both dice
 - (ii) sum of two numbers appearing on both the dice is 8. **U** [Board Term-2, 2012 Set (12)]
 - **Sol.** Total number of possible outcome = $6^2 = 36$ Same number on both dice = (1, 1), (2, 2), (3, 3), (4, 4),(5, 5) and (6, 6) No. of favourable outcomes = 6
 - (i) P(same number on both dice) = $\frac{6}{36} = \frac{1}{6}$ $1\frac{1}{2}$
 - (ii) Sum of two dice is 8 = (2, 6), (3, 5), (4, 4), (6, 2), (5, 3) No. of favourable outcome = 5

$$P(\text{sum is 8}) = \frac{5}{36}$$
 1¹/

[CBSE Marking Scheme, 2012]

- Q. 23. Five Cards, ten, Jack, Queen, King and Ace of diamonds are well shuffled. One card is picked up from them.
 - (i) Find the probability that the drawn card is Queen.
 - (ii) If Queen is put aside, then find the probability that the second card drawn is an ace.

C + **A** [Delhi CBSE Term-2, 2014]

- Sol. Total cards = 5
- $P(\text{Queen}) = \frac{1}{5}$ (i)

(ii)
$$P(Ace) = \frac{1}{4}$$
 (Since, Queen was kept aside)

$$(5-1=4)$$
 1

Q. 24. From all the two digit numbers a number is chosen at random. Find the probability that the chosen number is a multiple of 7.

U [Outside Delhi Compt. Set-III 2017]

Sol. All possible outcomes are 10, 11, 12 98, 99.	
No. of all possible outcomes $= 90$.	1
All favourable outcomes are 14, 21, 28 98	
No. of favourable outcomes $= 13$	1
$\therefore P(\text{getting a number multiple of 7}) = \frac{13}{90}$	1

[CBSE Marking Scheme, 2017]

- Q. 25. A box contains cards, number 1 to 90. A card is drawn at random from the box. Find the probability that the selected card bears a :
 - (i) Two digit number.
 - (ii) Perfect square number

U [Delhi Compt. Set-I 2017]

Sol. No. of all possible outcomes = 90

(i) No. of cords having 2 digit number = 90 - 9 = 81 \therefore No. of favourable outcomes = 81

$$= \frac{1}{\text{No. of all possible outcomes}} = \frac{1}{90} = \frac{1}{10}$$

(ii) Perfect square numbers between 1 to 90 are 1, 4, 9, 16, 25, 36, 49, 64, 81 \therefore No. of favourable outcomes = 9 P(Selected card bears perfect square numbers) $=\frac{9}{90}=\frac{1}{10}$ 1

[CBSE Marking Scheme, 2017]

- Q. 26. Two different dice are thrown together. Find the probability that the number obtained.
 - (i) have a sum less than 7.
 - (ii) have a product less than 16.
 - (iii) is a doublet of odd numbers.

U [Delhi Set-I, II, III 2017]

Sol. Total number of all possible outcomes
$$= 6^2 = 36$$

- (i) The sum less than 7 = (1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1(2, 1), (2, 2), (2, 3), (2, 4), (3, 1), (3, 2), (3, 3), (4, 1), (4, 2), (5, 1)
 - No. of favourable outcomes = 15

P(have sum less than 7) =
$$\frac{15}{36} = \frac{5}{12}$$
 1

(ii) Product less than 16 = (1, 1), (1, 2), (1, 3), (1, 4), (1, 5),(1, 6), (2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6), (3, 1), (3, 2),(3, 3), (3, 4), (3, 5), (4, 1), (4, 2), (4, 3), (5, 1), (5, 2), (5, 3),(6, 1), (6, 2)

No. of favourable out outcomes = 25

 \therefore *P*(have a product less than 16)

$$=\frac{25}{36}$$
 1

(iii) Doublet of odd numbers = (1, 1), (3, 3), (5, 5)

No. of favourable outcomes = 3

:. P(a doublet of odd number)

$$=\frac{3}{36}=\frac{1}{12}$$
 1

[CBSE Marking Scheme, 2017]

- Q. 27. A bag contains 20 balls out of which x balls are red. (i) If one ball is drawn at random from the bag, find the probability that it is not red.
 - (ii) If 4 more red balls are out into the bag, the probability of drawing a red ball will be $\frac{5}{4}$ times

the probability of drawing a red ball in the first case. Find the value of *x*.

C + U [Foreign Set III, 2015]

- Sol. Try yourself similar to Q. 20, SATQ- II.
- Q. 28. Peter throws two different dice together and finds the product of the two numbers obtained. Rina throws a die and squares the number obtained. Who has the better chance to get the numbers 25.

[Delhi Set-I, II, III 2017]

Sol. Peter throws two dice together

- \therefore Total number of possible outcomes = $6^2 = 36 \frac{1}{2}$
- He get 25 only when he gets (5, 5)
- \therefore No. of favourable outcomes = 1 $\frac{1}{2}$

P(getting the numbers of product 25) = $\frac{1}{36}$	1	$P(\text{getting a number whose square is } 25) = \frac{1}{6}$	
Rina throws one dice		1 1	1/2
\therefore Total number of all possible outcomes = 6		$\frac{1}{6} > \frac{1}{36}$	/2
The number where square is 25 is 5		Hence, Rina has better chances to get the num	he
\therefore No. of favourable outcomes = 1	1/2	square 25.	00

[CBSE Marking Scheme, 2017]



[KVS 2014] [Board Term-2 2012 Set(44)]



 $\frac{1}{2}$

- Q. 30. A piggy bank contains hundred 50 coins, fifty ₹ 1 coins, twenty ₹ 2 coins and ten ₹ 5 coins. If it is equally likely that one of the coins will fall out when the bank is turned upside down, what is the probability that the coin :
 - (i) Will be a 50 p coin ?
 - (ii) Will not be a ₹ 5 coin ?
 - (iii) Which mathematical concept is used in the above problem ? AE [Foreign Set III, 2014]
 - Sol. (i) Total number of coins = 100 + 50 + 20 + 10= 180 ^{1/2}

 \therefore Total number of possible outcomes of a coin will fall out = 180 $\frac{1}{2}$

Number of 50 p coins = 100

 \therefore Number of favourable outcomes relating to fall out of a 50 p coin = 100

 \therefore *P*(of getting a 50 p coin)

$$= \frac{\text{Number of favourable outcomes}}{\text{Total number of possible outcomes}} = \frac{100}{180} = \frac{5}{9} \text{ 1}$$

(ii)
$$P(\text{not a ₹ 5 coin}) = 1 - P(₹ 5 coin) = 1 - \frac{10}{180} = \frac{17}{18} \frac{1}{12}$$

Q. 31. A game of chance consists of spinning an arrow which comes of rest pointing at one of the number 1, 2, 3, 4, 5, 6, 7, 8 (see figure) and there are equally likely outcomes. What is the probability that it will point at :

(i) 8 ?

(ii) an odd number?

- (iii) a number greater than 2?
- (iv) a number less than 9?
- (v) Which mathematical concept is used in the above problem ?



- **Sol.** (i) Total number of points = 8 (*i.e.*, 1, 2, 3, 4, 5, 6, 7, 8)
 - ... Total number of possible outcomes in which an arrow comes to rest pointing at one of the number = 8 $\frac{1}{2}$ Number of favourable outcomes in which an arrow will point at 8 = 1
 - \therefore *P*(arrow will point at 8)

$$= \frac{\text{Number of favourable outcomes}}{\text{Total number of possible outcomes}} = \frac{1}{8}$$

(ii) Number of odd number points = 4 *i.e.*, (1, 3, 5, 7)
∴ Number of favourable outcomes in which an arrow will point at odd number = 4

- \therefore , *P*(arrow will point at odd number)
 - Number of favourable outcomes _ 4 _ 1
- Total number of possible outcomes $\begin{bmatrix} -8 & 2 \end{bmatrix}^{1/2}$

(iii) Number of points greater than 2

:. Number of favourable outcomes in which an arrow will point at a number greater than 2 = 6

- \therefore *P*(arrow will point at a number greater than 2) $\frac{1}{2}$
- Number of favourable outcomes Total number of possible outcomes $=\frac{6}{-}=\frac{3}{-}$

(iv) Number of points less than 9 = 8 *i.e.*, (1, 2, 3, 4, 5, 6, 7, 8) : Number of favourable outcomes in which an

ong Answer Type Questions

- Q. 1. Cards marked with numbers 3, 4, 5........, 50 are placed in a bag and mixed thoroughly. One card is drawn at random from the bag. Find the probability that number on the card drawn is :
 - (a) Divisible by 7.
 - (b) A perfect square.
 - (c) A multiple of 6. A [Board Sample Paper, 2016]
- **Sol.** Total number of cards = 48
 - Probability of an event

total number of favourable outcomes Total number of outcomes

Number of cards divisible by 7 = 7, 14, 21, 28, 35, 42, 49 = 7

 $P(\text{cards divisible by 7}) = \frac{7}{48}$

Number of cards having a perfect square = 4, 9, 16,25, 36, 49 = 6

 $P(\text{cards having a perfect square}) = \frac{6}{48} = \frac{1}{8}$

Number of multiples of 6 from 3 to 50 = 6, 12, 18, 24,30, 36, 42, and 48 = 8

 $P(\text{multiple of 6 from 3 to 50}) = \frac{8}{48} = \frac{1}{6}$

[CBSE Marking Scheme, 2016]

1

- Q. 2. All the red face cards are removed from a pack of 52 playing cards. A card is drawn at random from the remaining cards, after reshuffling them. Find the probability that the drawn card is :
 - (i) of red colour
 - (ii) a queen
- (iii) an ace
- (iv) a face card. A [CBSE O.D. 2014]
- Sol. Try yourself similar to Q. 1. SATQ- II.
- Q. 3. All the black face cards are removed from a pack of 52 cards. Find the probability of getting a,

(i) face card	(ii) red card
---------------	---------------

(iii) black card	(iv) king				
	[Delhi CBSE Term-2, 2014]				

- Sol. Try yourself similar to Q. 1. SATQ- II.
- Q. 4. A box contains cards bearing numbers from 6 to 70. If one card is drawn at random from the box, find the probability that it bears.
 - (i) a one digit number.
 - (ii) a number divisible by 5.

arrow will point at number less than
$$9 = 8$$

 $\therefore P(\text{arrow will point at a number less than 9})$
 $= \frac{\text{Number of favourable outcomes}}{\text{Total number of possible outcomes}} = \frac{8}{8} = 1$
(v) Probability.

(v)

(4 marks each)

1

- (iii) an odd number less than 30.
- (iv) a composite number between 50 and 70. A [Foreign Set, I, II, III, 2015]

Sol. Total number of cards = 65

- (i) *P* (one digit number) = 1
- No. divisible by 5 = 10, 15, 20, 25, 30, 35, 40, 45, (ii) 50, 55, 60, 65, 70 = 13
 - P (a number divisible by 5) = $\frac{13}{65} = \frac{1}{5}$
- Odd no. less than 30 = 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29 = 12

$$P$$
 (an odd number less than 30) = $\frac{12}{65}$ 1

(iv) Composite numbers = 51, 52, 54, 55, 56, 57, 58, 60, 62, 63, 64, 65, 66, 68, 69= 15 P (a composite number between 50 and 70)

$$= \frac{15}{65} = \frac{3}{13}$$
 1

[CBSE Marking Scheme, 2015]

- Q. 5. A box contains cards numbered from 1 to 20. A card is draw at random from the box. Find the probability that number on the drawn card is
 - (i) a prime number

Р

- (ii) a composite number
- (iii) a number divisible by 3

A [CBSE Comptt. I, II, III, 2018] [Board Term-2, 2015 Set I, II]

Ans. (i) Prime numbers from 1 to 20 are 2, 3, 5, 7, 11, 13, 17, 19 i.e. 8.

(prime number) =
$$\frac{8}{20}$$
 or $\frac{2}{5}$ 1¹/₂

(ii) Composite number from 1 to 20 are 4, 6, 8, 9, 10, 12, 14, 15, 16, 18, 20, *i.e.*, 11 11

$$P(\text{Composite number}) = \frac{11}{20} \qquad 1\frac{1}{2}$$

(iii) Number divisible by 3 from 1 to 20 are 3, 6, 9, 12, 15, 18 i.e., 6

P (number divisible by 3) =
$$\frac{6}{20}$$
 or $\frac{3}{10}$ 1

[CBSE Marking Scheme, 2018]

Commonly Made Error

- Many candidates commit the following errors.
 - (i) Total outcomes of event are incorrect.
 - (ii) Favourable outcomes are incorrect.
 - (iii) The results are not given in the simplest form. e.g.

 $\frac{8}{20} = \frac{2}{5}$

Answering Tip

- All necessary outcomes must be listed before finding probability and all answers must be in the simplest from.
- Q. 6. A card is drawn at random from a well-shuffled deck of playing cards. Find the probability that the card drawn is :
 - (i) a card of spade or an ace.
 - (ii) a black king.
- (iii) neither a jack nor a king.
- (iv) either a king or a queen. A [Outside Delhi CBSE Board Term-2, 2015, Set I, II, III]
- Sol. (i) Cards of spade or an ace = 13 + 3 = 16Total no. of cards = 52

P (spade or an ace) =
$$\frac{16}{52} = \frac{4}{13}$$

Black kings = 2

(ii)

P (a black king) = $\frac{2}{52} = \frac{1}{26}$

(iii) Jack or king
$$= 4 + 4 = 8$$

P (neither jack nor a king) = $\frac{52-8}{52}$

(iv) King or queen =
$$4 + 4 = P$$
 (either a king or a queen) = $\frac{8}{5}$

13 [CBSE Marking Scheme, 2015]

- Q. 7. A bag contains 15 balls of which x are blue and the remaining are red. If the number of red balls are increased by 5, the probability of drawing the red balls doubles. Find :
 - (i) P(red ball)

(ii) P(blue ball)

 \Rightarrow

 \Rightarrow

•

(i)

(ii)

1

1

1

13

(iii) P(blue ball if of 5 extra red balls are actually added) A [Board Term-2, 2015]

- Sol. According to the question, $\frac{20-x}{20} = 2\left(\frac{15-x}{15}\right)$

 $\frac{1}{2}$

1

$$1 - \frac{x}{20} = 2 - \frac{2x}{15}$$
$$\frac{2x}{15} - \frac{x}{20} = 2 - 1$$

$$\frac{8x-3x}{60} =$$

$$5x = 60$$

x = 12 ¹/₂

1

Blue balls = 12 and red balls = 3

$$P(\text{red ball}) = \frac{3}{15} = \frac{1}{5}$$

 $P(\text{blue ball}) = \frac{12}{15} = \frac{4}{5}$

(iii) *P*(blue ball if 5 red balls are added) = $\frac{12}{20} = \frac{3}{5}$ 1

[CBSE Marking Scheme, 2015]

- \mathbf{Q} . 8. Three digit numbers are made using the digits 4, 5, 9 (without repetition). If a number among them is selected at random, what is the probability that the number will :
 - (i) be a multiple of 5?
 - (ii) be a multiple of 9?

(iii) will end with 9? A [Board Term-2, 2014]

- Sol. Total number of three digit numbers are : 459, 495, 549, 594, 945, 954 = 61
 - $P(\text{multiple of 5}) = \frac{2}{6} = \frac{1}{3}$ (i) 1

(ii)
$$P(\text{multiple of 9}) = \frac{6}{6} = 1$$
 1

(iii)
$$P(\text{ending with 9}) = \frac{2}{6} = \frac{1}{3}$$
 1

Q. 9. A number x is selected at random from the numbers 1, 2, 3 and 4. Another number y is selected at random from the numbers 1, 4, 9 and 16. Find the probability that product of x and y is less than 16.

A [Board Term-2, Outside Delhi Set II 2016]

-	Istal possible or	ite	mo	-	1, 2,	3,4	81	4,9,	16	=	16
-		1	2	3	4					_	
	1	1	.2	3	4						
	4	4.	8	12	16						
	9	9	18	271	36				-	,	
	1	16.	32	48	64		2.				

Q. 10. Two different dice are rolled together once. Find the probability of numbers coming on the tops whose product is a perfect square.

Lavourably

A [Outside Delhi Compt. Set-I, 2017]

PSEJ

Sol. No. of all possible outcomes =
$$6^2 = 36$$
 1
All favourable outcomes are (2, 2), (3, 3), (4, 4) (5, 5), (6, 6), (1, 1), (4, 1), (1, 4)
 \therefore No. of favourable outcomes = 8 **1**¹/₂
 \therefore P(getting the numbers, whose product is a perfect square) = $\frac{8}{36} = \frac{2}{9}$. **1**¹/₂

[CBSE Marking Scheme, 2017]

- Q. 11. A box contains 125 shirts of which 110 are good 12 have minor defects and 3 have major defects Ram Lal will buy only those shirts which are good while Naveen will reject only those which have major defects. A shirt is taken out at random from the box. Find the probability that :
 - (i) Ram Lal will buy it
 - (ii) Naveen will buy it

A [Outside Delhi Set-III, 2017]

Sol. No. of all possible outcomes = 125 $\frac{1}{2}$ (i) Ramlal will buy a good shirt \therefore No. of favourable out comes = 110 $\frac{1}{2}$ \therefore P(Ramlal will buy a shirt)

 $= \frac{\text{No. of favourable outcomes}}{\text{No. of all possible outcomes}}$

$$=\frac{110}{125}=\frac{22}{25}$$
 1¹/₂

(ii) Naveen will reject the shirt which have major defects.

 \therefore No. of favourable outcomes = 125 - 3 = 122

... P(Naveen will buy the shirt)

122

125

$$= \frac{\text{No. of favourable outcomes}}{\text{No. of all possible outcomes}}$$

[CBSE Marking Scheme, 2017]

 $1\frac{1}{2}$

Q. 12. The king, queen and jack of clubs are removed from a deck of 52 cards. The remaining cards are

mixed together and then a card is drawn at random from it. Find the probability of getting (i) a face card, (ii) a card of heart, (iii) a card of clubs (iv) a queen of diamond. A [Delhi Compt. Set-II, 2017]

Sol. No. of all possible outcomes = 52 - 3 = 49(i) No. of face cards = 12 - 3 = 9Required probability = $\frac{9}{49}$ (ii) No. of card of heart in the deck = 13 \therefore Required probability = $\frac{13}{49}$ 1 (iii) No. of cards of clubs = 13 - 3 = 10Provide the set of the set of

:. Required probability =
$$\frac{10}{49}$$
 1

(iv) There is only one queen of diamond

$$\therefore$$
 Required probability = $\frac{1}{49}$ 1

[CBSE Marking Scheme, 2017]

[Topper Answer, 2016] 4

Q. 13. A box contains 90 discs which are numbered 1 to 90. If one disc is drawn at random from the box, find the probability that it bears (i) a two digit number, (ii) number divisible by 5.

A [Foreign Set-I, II, III 2017]

Sol. Total number of discs in the box $= 90$	
\therefore No. of all possible outcomes = 90	$\frac{1}{2}$
(i) Discs with two digit number are 10, 11, 90	
No. of discs with two digits numbers $= 90 - 9 =$	81
	$\frac{1}{2}$
\therefore No. of favourable outcomes = 81	
<i>P</i> (a disc with two digit number)	
No. of favourable outcomes	
= No. of all possible outcomes	1/2
81 0	
$=\frac{61}{90}=\frac{9}{10}$	$\frac{1}{2}$
90 10	
(ii) The numbers divisible by 5 from 1 to 90 are 5, 10,	15
85, 90	1/2
\therefore No. of favourable outcomes = 18	
\therefore <i>P</i> (a disc with a number divisible by 5)	
18 1	

$$= \frac{18}{90} = \frac{1}{5} \qquad 1\frac{1}{2}$$

[CBSE Marking Scheme, 2017]

having product lus than 16

2

Favourable Guent outcome

Jotal went

7+1

16

8-1

16

Q. 14. Two different dice are thrown together. Find the probability that the numbers obtained have

- (i) even sum, and
- (ii) even product.

A [OD Set-III-2017]



- Q. 15. From a deck of 52 playing cards, Jacks and kings of red colour and Queen and Aces of black colour are removed. The remaining cards are mixed and a card is drawn at random. Find the probability that the drawn card is :
 - (i) A black Queen
 - (ii) A card of red colour
 - (iii) A Jack of black colour
 - (iv) A face card A [Outside Delhi Compt. Set-I 2017]
 - **Sol.** No. of all possible outcomes = 52 (2 + 2 + 2 + 2)= 44

(i) No. of black Queens in the deck
$$= 0$$

$$\therefore$$
 P(getting a black Queen) = $\frac{0}{44} = 0$

Hence it is an impossible event

(ii) No. of red cards =
$$26 - 4 = 22$$

 \therefore P(getting a red card) = $\frac{22}{44} = \frac{1}{2}$ 1

44

(iii) No. of Jacks (black) = 2
∴ P(getting a black coloured Jack)

$$=\frac{1}{22}$$

1

1

(iv) No. of face cards in the deck = 12 - 6 = 6

$$\therefore P(\text{getting a face card}) = \frac{6}{44} = \frac{3}{22} \qquad 1$$

[CBSE Marking Scheme, 2017]

- Q. 16. Cards on which numbers 1, 2, 3 100 are written (one number on one card and no number is repeated) and put in a bag and are mixed thoroughly. A card is drawn at random from the bag. Find the probability that card taken out has.
 - (i) An even number
 - (ii) A number which is a multiple of 13.
 - (iii) A perfect square number
 - (iv) A prime number less than 20.

A [Delhi Compt. 2017]

- **Sol.** Total number of possible outcomes = 100
 - (i) Number of even numbers from 1 to 100 = 50

 \therefore P (card taken out has an even number)

$$=\frac{50}{100}=\frac{1}{2}$$
 1

(ii) Multiple of 13 from 1 to 100 are 13, 26, 39, 52, 65, 78 and 91.

No. of favourable outcomes = 7

$$\therefore P(\text{card taken out has multiple of } 13) = \frac{7}{100} \qquad 1$$

(iii) Perfect square numbers from 1 to 100 are – 1, 4, 9, 16, 25, 36, 49, 64, 81 and 100.

No. of all favourable outcomes = 10

:. P(card taken out has a perfect square number)

$$=\frac{10}{100}=\frac{1}{10}$$
 1

(iv) Prime numbers less than 20 are 2, 3, 5, 7, 11, 13, 17 and 19.

No. of all favourable outcomes = 8

...P(card taken out has a prime number less than 20)

$$=\frac{8}{100}=\frac{2}{25}$$
 1

[CBSE Marking Scheme, 2017]

Q. 17. In fig. a disc on which a player spins an arrow

twice. The fraction $\frac{a}{b}$ is formed, where 'a' is the

number of sector on which arrow stops on the first spin and 'b' is the number of the sector in which the arrow stops on second spin, On each spin, each sector has equal chance of selection by the arrow.

Find the probability that the fraction $\frac{a}{h} > 1$.



[Foreign Set I, II, III, 2016]

- **Sol.** For $\frac{a}{b} > 1$, when a = 1, b can not take any value, a
 - = 2, b can take 1 value, a = 3, b can take 2 values, a = 4, b can take 3 values $2^{1/2}$

When a = 5, b can take 4 values, a = 6, b can take 5 values.

Total possible outcomes = 36 $\frac{1}{2}$

$$\therefore P\left(\frac{a}{b} > 1\right) = \frac{1 + 2 + 3 + 4 + 5}{36}$$
$$= \frac{15}{36} \text{ or } \frac{5}{12}$$
1

[CBSE Marking Scheme, 2016]

- Q. 18. A bag contains 25 cards numbered from 1 to 25. A card is drawn at random from the bag. Find the probability that the number on the drawn card is : (i) divisible by 3 or 5
 - (ii) a perfect square number.

U [Delhi CBSE Board Term-2, 2015 (Set III)]

Sol. (i) Total number of cards = 25 Number divisible by 3 = 3, 6, 9, 12, 15, 18, 21, 24, Number divisible by 5 = 5, 10, 15, 20, 25, 1

Number divisible by 3 or
$$5 = 13$$
 1
 $\therefore P(\text{no. divisible by 3 or 5}) = \frac{13}{25}$
ii) Perfect square = 1, 4, 9, 16, 25, 1
 $\therefore P(\text{a perfect square no.}) = \frac{5}{25} = \frac{1}{5}$ 1

[CBSE Marking Scheme, 2015]

Q. 19. A dice is rolled twice. Find the probability that :

- (i) 5 will not come up either time.
- (ii) 5 will come up exactly one time.

U [Delhi CBSE 2014]

Sol. When a dice is rolled twice, the total outcomes = $6^2 = 36$ **1**

The outcomes in which 5 will not come either time are

 $\{(1, 1), (1, 2), (1, 3), (1, 4), (1, 6) \\ (2, 1), (2, 2), (2, 3), (2, 4), (2, 6) \\ (3, 1), (3, 2), (3, 3), (3, 4), (3, 6) \\ (4, 1), (4, 2), (4, 3), (4, 4), (4, 6) \\ (6, 1), (6, 2), (6, 3), (6, 4), (6, 6)\} \\ \text{No. of favourable outcomes} = 25$

- :. (i) $P(5 \text{ will not come up either time}) = \frac{25}{36}$
 - (ii) The outcomes in which 5 will come exactly one time are

 $\{(1, 5), (2, 5), (3, 5), (4, 5), (5, 1), (5, 2), (5, 3), (5, 4), (5, 6), (6, 5)\}$

 \therefore Number of favourable outcomes = 10

$$P(5 \text{ will come up exactly one time}) = \frac{10}{36} = \frac{5}{18}$$
 3

Q. 20. The King, Queen and Jack of clubs are removed from a pack of 52 cards and then the remaining cards are well shuffled. A card is selected from the remaining cards. Find the probability of getting a card.

Ans. Total number of cards = 52 - 3 = 49

(i)
$$P(spade) = \frac{13}{49}$$
 1

(ii) P(black king) =
$$\frac{1}{49}$$
 1

(iii)
$$P(club) = \frac{10}{49}$$
 1

(iv)
$$P(Jack) = \frac{3}{49}$$
 1

[CBSE Marking Scheme, 2018]

Detailed Answer :

Total number of cards = 52 - 3 = 49

(i) Number of spade card = 13

$$\therefore \qquad P(\text{getting a spade}) = \frac{13}{49} \qquad 1$$



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