



MATHS

BOOKS - MODERN PUBLISHERS MATHS (HINGLISH)

PROBABILITY

Illustrative Examples

1. In each of the following experiments specify appropriate sample space

(i) A boy has a 1 rupee coin, a 2 rupee coin and a 5 rupee coin in his pocket. He takes out two coins out of his pocket, one after the other. (ii) A person is noting down the numb

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2. Three coins are tossed simultaneously. Find the sample space.



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3. A bag contains 4 identical red balls and 3 identical black balls. The experiment consists of drawing one ball, then putting it into the bag and again drawing a ball. What are the possible outcomes of the experiment?



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4. Write the sample space of each of the following Random experiments.

- (i) A coin is tossed two times
- (ii) A coin is tossed and a die is thrown
- (iii) A coin is tossed three times
- (iv) A coin is tossed once
- (v) A die is thrown once.



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5. Two dice are rolled Let A,B and C be the events of getting a sum 2, a sum 3 and a sum 4 respectively.

a. (i) Is event A simple?

(ii) Is event B simple?

(iii) Is event C compound?

b. Are events A and B mutually exclusive?

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6. A coin is tossed three times, consider the following events. A : No head appears, B: Exactly one head appears and C: Atleast two appear. Do they form a set of mutually exclusive and exhaustive events?

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7. For a post,three persons A, B and C appearin the interview. The probability of A being selected is twice that of B and the probability of b

being selected is thrice that of C. What of the individual probability of A, B and C being selected?



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8. Given $P(A) = 0.54$, $P(B) = 0.69$ and $P(A \cap B) = 0.35$

(i) $P(A' \cap B')$ (ii) $P(A \cap B')$



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9. A and B are two non mutually exclusive events. If $P(A) = \frac{1}{4}$, $P(B) = \frac{2}{5}$, and $P(A \cup B) = \frac{1}{2}$, find the values of $P(A \cap B)$ and $P(A \cap \bar{B})$



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10. In a class of 25 students with roll numbers 1 to 25, a student is picked up at random to answer a question. Find the probability that the roll

number of the selected student is either a multiple of 5 or of 7.

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11. Tickets are numbered from 1 to 100. One ticket is picked up at random. Find the probability that the ticket picket up has a number, which is divisible by 5 or 8.

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12. Two dice are tossed once. Find the probability of getting an even number on the first die or a total of 8.

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13. A pair of dice is thrown once. Find the probability that neither a doublet nor a total of 10 will appear.

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14. A box contains 100 bolts and 50 nuts, it is given that 50% bolts and 50% nuts are rusted. Two objects are selected from the box at random. Find the probability that both are bolts or both are rusted.

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15. Two students Anil and Ashima appeared in an examination. The probability that Anil will qualify the examination is 0.05 and that Ashima will qualify the examination is 0.10. The probability that both will qualify the examination is 0.02. Find the probability that:

(i) both Anil and Ashima will not qualify the examination.

(iii) only one of them will qualify the examination.

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16. In a given race, the odds in favour of horses, A, B, C, D are 1:3, 1:4, 1:5 and 1:6 respectively. Find the probability that one of them wins the race.



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Faqs

1. Let a sample space be:

$S = \{\omega_1, \omega_2, \dots, \omega_n\}$. Which of the following assignments of probability to each outcome are valid?

Outcomes $\omega_1, \omega_2, \omega_3, \omega_4, \omega_5, \omega_6$

a. $\frac{1}{6}, \frac{1}{6}, \frac{1}{6}, \frac{1}{6}, \frac{1}{6}, \frac{1}{6}$

b. 1, 0, 0, 0, 0, 0

c. $\frac{1}{8}, \frac{2}{3}, \frac{1}{3}, \frac{1}{3}, -\frac{1}{4}, -\frac{1}{3}$

d. $\frac{1}{12}, \frac{1}{12}, \frac{1}{6}, \frac{1}{6}, \frac{1}{6}, \frac{3}{2}$

e. 0.1, 0.2, 0.3, 0.4, 0.5, 0.6



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2. One card is drawn from a well shuffled deck of 52 cards. If each outcome is equally likely, calculate the probability that the card will be:

(i) a diamond

(ii) not a diamond

(iii) not an ace

(iv) a black card (i.e. a club or a spade)

v. not a black card.



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3. A bag contains 5 black and 3 white balls. Two balls are drawn at random. Find the probability of drawing:

(i) 2 black balls (ii) 2 white balls.



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4. The letters of SOCIETY are placed at random in a row. What is the probability that three vowels come together?



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5. What is the probability that a leap year selected at random contains 53 Sundays is

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6. Four coins are tossed simultaneously. Write the sample space and then complete the following table:

No. of heads :	0	1	2	3	4
Probability :					

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7. Two dice are thrown simultaneously. Find the probability of getting six as a product.

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8. A class consists of 10 boys and 8 girls. Three students are selected at random. Find the probability that the selected group has:

(i) all boys (ii) all girls (iii) 2 boys and 1 girl.



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9. A certain team wins with probability 0.7, loses with probability 0.2 and ties with probability .1 the team plays three games. Find the probability that the team wins at least two of the games, but not lose.



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10. A bag contains 20 tickets numbered 1 to 20. Two tickets are drawn at random. Find the probability that both the numbers on the ticket are prime.



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11. A bag contains 50 tickets numbered 1, 2, 3, ..., 50 of which five are drawn at random and arranged in ascending order of magnitude x_1



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12. Find the probability of 4 turning up at least once in two tosses of a fair die.



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13. A card is selected from a pack of 52 cards.

- (a) How many points are there in the sample space?
- (b) Calculate the probability that the card is an ace of spades.
- (c) Calculate the probability that the card is (i) an ace (ii) black card.



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14. Four digit numbers are formed by using the digits 1,2,3,4 and 5 without repeating any digit. Find the probability that a number, chosen at random, is an odd number.



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15. A committee of two persons is selected from two men and two women. What is the probability that the committee will have (a) no man? (b) one man? (c) two men?



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16. There are three events E_1 , E_2 and E_3 one of which must, and only one can happen. The odds are 7 to 4 against E_1 and 5 to 3 against E_2 . Find odds against E_3 .



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Exercise 16 A Short Answer Type Questions

1. Describe the sample space or the indicated experiment in the following
 - a. A coin is tossed twice.
 - b. Consider the experiment in which a coin is tossed repeatedly until a head comes up.

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2. Describe the sample space or the indicated experiment in the following
Two coins (a one rupee and a two rupee coin) are tossed once.

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3. Describe the sample space for the indicated experiment : 2 boys and 2 girls are in Room X, and 1 boy and 3 girls in Room Y. Specify the sample space for the experiment in which a room is selected and then a person.

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4. A box contains 1 red and 3 identical white balls. Two balls are drawn at random in succession without replacement. Write the sample space for this experiment.

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5. An experiment consists of tossing a coin and then tossing it second time if head occurs. If tail occurs on the first toss, then a die is tossed once. Find the sample space.

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6. A coin is tossed. If it shows head, we draw a ball from a bag consisting of 3 blue and 4 white balls; if it shows tail we throw a die. Describe the sample space of this experiment.

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7. Describe the sample space for the indicated experiment : One die of red colour, one of white colour and one of blue colour are placed in a bag. One die is selected at random and rolled, its colour and the number on its uppermost face is noted

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8. An experiment consists of rolling a die and the tossing a coin once if the number on the die is even.If the number on the die is odd, the coin is tossed twice. Write the sample space for this experiment.

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9. A com is tossed. If the outcome is a head, a die is thrown. If the die shows up an even number, the die is thrown again. What is the sample space for the experiment?

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10. A coin is tossed. If it shows a tail, we draw a ball from a box which contains 2 red and 3 black balls. If it shows head, we throw a die. Find the sample space for this experiment.

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11. Find the sample space associated with the experiment of rolling a pair of dice (one is blue and the other red) once. Also, find the number of elements of this sample space.

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Exercise 16 B Short Answer Type Questions

1. Consider the experiment of rolling a die. Let A be the event "getting a prime number". B be the event "getting an odd number". Write the sets representing the events (i) A or B (ii) A and B (iii) A but not B (iv) "not A".



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2. A die is thrown twice. Each time then number appearing on it is recorded. Describe the following events: A = both numbers are odd. B = both numbers are even. C = sum of the numbers is less that 6. Also, find $A \cup B$, $A \cap B$, $A \cup C$, $A \cap C$. Which pairs of events are mutually exclusive?



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3. Two dice are thrown and the sum of the numbers which come up on the dice is noted. Let us consider the following events associated with this experiment A : the sum is even. B : the sum is a multiple of 3. C : the sum is less than 4. D : the sum is great



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4. A coin is tossed once. Then if it turns up a head a die is thrown once, if it turns up a tail it is tossed twice more. Describe:

(i) the sample space S of the experiment

(ii) the event A that exactly one head occurs.

(iii) the event B that at least two tails occur or a number greater than 4 occurs.



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5. A die is thrown. Describe the following events:

(i) A : a number less than 7

(ii) B : a multiple of 3

(iii) C : a number not less than 4

(iv) d : an odd number greater than 2

(v) E : an even number greater than 2.



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6. A pair of dice is thrown. Find the following events:

- (i) Same numbers on both the dice
- (ii) The sum is greater than 10
- (iii) Even numbers on both the dice
- (iv) Odd numbers on both the dice
- (v) The sum is 7.



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7. From a group of 2 boys and 3 girls, two children are selected at random. Describe the events:

- (i) A: both selected children are girls
- (ii) B: the selected group consists of one boy and one girl
- (iii) C: at least one boy is selected.



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8. Three coins are tossed once. Let A denote the event "three heads show", B denote the event "two heads and one tail show", C denote the event three tails show and D denote the event "a head shows on the first coin". Which events are (i) mutually e

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9. Two dice are thrown. The events A, B and C are as follows: A : getting an even number on the first die. B : getting an odd number on the first die. C : getting the sum of the numbers on the dice 5. Describe the events (i) A' (ii) not B

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10. Refer to question 6 above, state true or false: (give reason for your answer) (i) A and B are mutually exclusive. (ii) A and B are mutually exclusive and exhaustive. (iii) $A = B'$ (iv) A and C are mutually exclusive. (v) A and $B \cap C$



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Exercise 16 C Short Answer Type Questions Satq

1. Which of the following cannot be valid assignment of probabilities for outcomes of sample space

$$S = \{\omega_1, \omega_2, \omega_3, \omega_4, \omega_5, \omega_6, \omega_7\}?$$

Assignment $\omega_1, \omega_2, \omega_3, \omega_4, \omega_5, \omega_6, \omega_7$

a. 0.1, 0.01, 0.05, 0.03, 0.01, 0.3, 0.6

b. $\frac{1}{7}, \frac{1}{7}, \frac{1}{7}, \frac{1}{7}, \frac{1}{7}, \frac{1}{7}, \frac{1}{7}$

c. 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7

d. -0.1, 0.2, 0.3, 0.4, -0.2, 0.1, 0.3

e. $\frac{1}{14}, \frac{2}{14}, \frac{3}{14}, \frac{4}{14}, \frac{5}{14}, \frac{6}{14}, \frac{15}{14}$



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2. If $\frac{4}{11}$ is the probability of an event A what is the probability of the event not A.



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3. A coin is tossed twice, what is the probability that atleast one tail occurs?



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4. The odds in favour of occurrence of an event are 5:13. find the probability that it will occur.



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5. (i) Two cards are drawn without replacement from a well shuffled pack of 52 cards. Find the probability that one is a spade and the other is a queen of red colour.

(ii) Two cards are drawn from a well shuffled pack of 52 cards one after the other without replacement. Find the probability that one of these is a queen and the other is a king of opposite colour.



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6. 4 cards are drawn from a well - shuffled deck of 52 cards. What is the probability of obtaining 3 diamonds and one spade?



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7. A bag contains 6 red, 5 white and 4 black balls. Two balls are drawn. Find the probability that none of them is red.



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8. A bag contains 6 red, 4 white and 8 blue balls. If three balls are drawn at random, find the probability that one is red, one is white and one is blue.



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9. The possibility that a non-leap year has 53 sundays, is

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Exercise 16 C Long Answer Type Questions Latq

1. A fair coin with 1 marked on one face and 6 on the other and a fair die are both tossed. Find the probability that the sum of numbers that turn up is (i) 3 (ii) 12.

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2. In a simultaneously toss of two coins, find the probability of:

(i) exactl 2 tails (ii) exactly 1 tail (iii) no tails.

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3. Three unbiased coins are tossed once. Find the probability of getting:

(i) two heads (ii) one head or two heads.

(iii) at least 2 heads

(iv) at most 2 heads

v. at most one head.



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4. A die is thrown once. If probability of an event X is denoted by $P(X)$,

find:

a. (i) $P(\text{even number})$

(ii) $P(\text{a number} \geq 3)$

(iii) $P(\text{a number between 2 and 5})$

b. (i) $P(\text{a number} \geq 4)$

(ii) $P(\text{a number} < 7)$

(iii) $P(\text{a number} > 6)$.



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5. In a single throw of two dice, find:

(i) $P(\text{odd number on first die and 6 on the second})$

(ii) $P(\text{a number} > 4 \text{ on each die})$

(iii) $P(\text{a total of 11})$

(iv) $P(\text{a total of 9 or 11})$

(v) $P(\text{a total of 11 or 12})$

(vi) $P(\text{a total of 10 or 12})$

(vii) $P(\text{a total of 9 or 10})$

(viii) $P(\text{a total of 10 or 11})$ (ix) $P(\text{a total of 8 or 9})$

(x) $P(\text{a total} > 8)$



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6. A pair of fair dice are thrown. Find the probability that the sum is 10 or greater if a 5 appears on the first die.



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7. In a single throw of three dice, find the probability of getting:

(i) a total of 5

(ii) a total of a most 5

(iii) a total of atleast 5

(iv) the same number on all the dice.



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8. (i) In a single throw of two dice, determine the probability of obtaining a total of 2 or 4.

(ii) In a single throw of two dice, find the probability of obtaining a total of 9 or 11.

(iii) In a single throw two dice, find the probability of getting a total of 10 or 11.



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9. Find the probability of getting the product of a perfect square (square of a natural number), when two dice are thrown together.



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10. (i) Two dice are thrown together. What is the probability that the sum of the numbers on the two faces is neither 9 nor 11?

(ii) Two dice are thrown together. What is the probability that the sum of the numbers on the two faces is divisible by 3 or 4?



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11. One card is drawn from a well shuffled deck of 52 cards. If each outcome is equally likely, calculate the probability that the card will be

(i) a diamond (ii) not an ace (iii) not a king (iv) a black card (i.e. a club or a spade)

(v) a red card

(vi) not a diamond (vii) not a black card.



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12. Find the probability that in a random arrangement of the letters of the word UNIVERSITY the two *I* do not come together.

A. $\frac{3}{5}$

B. $\frac{4}{5}$

C. $\frac{2}{5}$

D. none of these

Answer: B



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13. A bag contains 9 discs of which 4 are red. 3 are blue and 2 are yellow. The discs are similar in shape and size. A disc is drawn at random from the bag. Calculate the probability that it will be (i) red. (ii) yellow, (iii) blue, (iv) not blue, (v)



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14. Two coins are tossed simultaneously. Complete the following table:

<i>Number of Heads :</i>	0	1	2
<i>Probability :</i>	(i)	(ii)	(iii)



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15. Two dice are tossed simultaneously. Complete the following table:

<i>Total number of points :</i>	2	3	4	5	6	7	8	9	10	11	12
<i>Probability :</i>											



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16. Three coins are tossed simultaneously. Write the sample space and complete the following table:

Number of Heads: 0 1 2 3

Probability: (i) (ii) (iii)(iv)

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17. An urn contains 9 red, 7 white and 4 black balls. A ball is drawn at random. What is the probability that the ball drawn is:

(i) red (ii) white (iii) red or black

(iv) white or black (v) not red?

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18. Six boys and six girls sit in a row randomly. Find the probability that (i) the six girls sit together, (ii) the boys and girls sit alternately.

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19. A coin is tossed thrice. If event E denotes the number of heads is odd and event F denotes the number of tails is odd, then find the cases favourable to the event $E \cap F$.

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20. (i) What is the probability that the numbers selected from the numbers 1,2,3,.....,30 is a prime number?

You may assume that each of the 30 numbers is equally likely to be selected.

(ii) What is the probability that a number selected from 1,2,3,.....,25 is a prime number if each of the 25 numbers is equally likely to be selected?

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1. A bag contains 3 red balls bear in one of the numbers 1,2, or 3 (one number on one ball), and 2 black balls bearing the numbers 4 or 6. A ball is drawn, its number is noted and the ball is repalced in the bag. Then another ball is drawn and its number is noted. Find the probability of drawing:

- (i) 2 on the first draw and 6 on the second draw
- (ii) a number ≤ 2 on the first draw and 4 on the second draw
- (iii) a total of 5.

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2. 20 cards are numbered from 1 tro 20. One card is drawn at random. What is the probability that the nnumbe on the cards ids: (i) a multiple of 4 ? (ii) not a multiple of 4? (iii) Odd? (iv) greater than 12? (v) divisible by 5? (vi) not a multiple of 6?

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3. A fair coin is tossed four times, and people win Re 1 for each head and lose Rs 1.50 for each tail that turns up. From the sample space calculate how many different amounts of money you can have after four tosses and the probability of having each

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Exercise 16 D Short Answer Type Questions Satq

1. Check whether the following probabilities $P(A)$ and $P(B)$ are consistently defined:

(i) $P(A) = 0.5, P(B) = 0.7, P(A \cap B) = 0.06$

(ii) $P(A) = 0.5, P(B) = 0.4, P(A \cup B) = 0.8$

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2. Events E and F are such that $P(\text{not } E \text{ or not } F) = 0.25$. State whether E and F are mutually exclusive.



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3. If E and F are events such that $P(E) = \frac{1}{4}$, $P(F) = \frac{1}{2}$ and $P(E \text{ and } F) = \frac{1}{8}$, find (i) $P(E \text{ or } F)$ (ii) $P(\text{not } E \text{ and not } F)$.



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4. Given $P(A) = \frac{2}{5}$ and $P(B) = \frac{1}{5}$ find $P(A \text{ or } B)$ if A and B are mutually exclusive events.



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5. What is the probability that a number selected from the number 1,2,3,..., 25 is a prime number, when each of the given numbers is equally likely to be selected?



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6. A card is drawn from a well shuffled deck of 52 cards. Find the probability of drawing.

(i) a black king

(ii) a jack, queen, king or an ace.

(iii) a card, which is neither a heart nor a king

(iv) a spade or club.



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7. (i) A pair of dice is rolled. Find the probability of getting a doublet or sum of numbers to be at least 10.

(ii) Two dice are tossed together. Find the probability of getting a doublet or (a) total o 10 (b) total of 6.



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8. Find the probability of getting 2 or 3 tails when a coin is tossed four times.



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9. In an entrance test that is graded on the basis of two examinations, the probability of a randomly chosen student passing the first examination is 0.8 and the probability of passing the second examination is 0.7. The probability of passing at least one of them is 0.95. What is the probability of passing both?



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Exercise 16 D Short Answer Type Questions I Satq

1. One card is drawn from a pack of 52 cards, each of the 52 cards being equally likely to be drawn. Find the probability if:

- (i) the card drawn is red
- (ii) the card drawn is a king
- (iii) the card drawn is red and a king
- (iv) the card drawn is either red or king.



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2. a. The probability that a student will receive an A,B,C or D grade is 0.40, 0.35, 0.15 and 0.10 respectively. Find the probability that a student will receive:

(i) not an A grade(ii) at most a C grade

(iii) B or C grade.

b. Neelam is taking up subjects Mathematics Physics and Chemistry. She estimates that her probabilities of receiving a grade A in these courses, are 0.2, 0.3 and 0.9 respectively. If the grades can be regarded as independent events, find the probabilities that Neelam receives,

(i) All A's (ii) NO A's

(iii) Exactly two A's



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3. A bag contains 100 identical tokens on which numbers 1 to 100 are marked. A token is drawn randomly. What is the probability that the

number on the token is:

- 9i) an even number (ii) an odd number
- (iii) a multiple of 3 (iv) a multiple of 5
- (v) a multiple of 3 and 5
- (vi) a multiple of 3 or 5 (vii) less than 20
- (viii) greater than 70?



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4. Say True or False giving reasons:

(i) $P(A) = \frac{1}{3}$, $P(B) = \frac{2}{3}$, A and B are mutually exclusive and exhaustive

(ii) $P(A) = 0.4$, $P(B) = 0.25$, $P(A \text{ or } B) = 0.65$.

A and B are mutually exclusive events.

(iii) $P(A) = 0.3$, $P(B) = 0.45$, $P(A \text{ and } B) = 0.2$, A and B are not mutually exclusive events.

(iv) $P(A) = 0.35$, $P(B) = 0.65$, A and B are complementary events.



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5. A and B are two mutually exclusive events of an experiment. If $P(\bar{A}) = 0.65$, $P(A \cup B) = 0.65$ and $P(B) = p$, find the value of p .

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6. A, B, C are three mutually exclusive and exhaustive events associated with a random experiment. Find $P(A)$, it being given that $P(B) = \frac{3}{2}P(A)$ and $P(C) = \frac{1}{2}P(B)$.

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Objective Type Questions

1. If A and B are any two events having $P(A \cap B) = \frac{1}{2}$ and $P(A) = \frac{2}{3}$, then the probability of $A \cap \bar{B}$ is :

A. $\frac{1}{2}$

B. $\frac{2}{3}$

C. $\frac{1}{6}$

D. $\frac{1}{3}$

Answer: C



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2. If A,B,C are three mutually exclusive and exhaustive events of an experiment such that $3P(A) = 2P(B) = P(C)$, then P(A) is equal to:

A. $\frac{1}{11}$

B. $\frac{2}{11}$

C. $\frac{5}{11}$

D. $\frac{6}{11}$

Answer: B



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3. In a non-leap year, the probability of having 53 Tuesday or 53 Wednesday is

A. $\frac{1}{7}$

B. $\frac{2}{7}$

C. $\frac{3}{7}$

D. None of these

Answer: A



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4. Three numbers are chosen from 1 to 20. Find the probability that they are consecutive.

A. $\frac{186}{190}$

B. $\frac{187}{190}$

C. $\frac{188}{190}$

D. $\frac{18}{{}^{20}C_3}$

Answer: B



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5. If M and N are any two events, then probability that at least one of them occurs is:

A. $P(M) + P(N) - 2P(M \cap N)$

B. $P(M) + P(N) - P(M \cap N)$

C. $P(M) + P(N) + P(M \cap N)$

D. $P(M) + P(N) + 2P(M \cap N)$

Answer: B



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6. When a dice is rolled, find the probability of getting an even prime number.

A. $\frac{1}{6}$

B. $\frac{3}{6}$

C. $\frac{3}{6}$

D. $\frac{5}{6}$

Answer: A



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7. If A and B are mutually exclusive events such that $P(A) = \frac{3}{5}$ and $P(B) = \frac{1}{5}$ then the value of $P(A \text{ or } B)$ is

A. $\frac{3}{5}$

B. $\frac{1}{5}$

C. $\frac{4}{5}$

D. $\frac{2}{5}$

Answer: C



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8. If $P(A) = 0.15$, $P(B) = 0.35$, $P(\bar{A}) + P(\bar{B})$ is equal to

A. 0

B. 1

C. 1.5

D. 8

Answer: B



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9. When a coin is tossed three times, the number of possible outcomes is:

A. 3

B. 6

C. 8

D. None of these

Answer: C

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10. If coin is tossed twice, then the number of possible outcomes is

A. 2

B. 4

C. 6

D. 8

Answer: B

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11. 6 boys and 6 girls sit in a row at random. Find the probability that all the girls sit together.

A. $\frac{1}{432}$

B. $\frac{12}{431}$

C. $\frac{1}{132}$

D. None of these

Answer: C



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12. Three dice are rolled once. The chance of getting a score of 5 is:

A. $\frac{5}{216}$

B. $\frac{1}{6}$

C. $\frac{1}{36}$

D. $\frac{1}{7^2}$

Answer: C



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13. A box contains 6 red marbles numbered 1 through 6 and 4 white marbles numbered 12 through 15. Find the probability that a marble drawn at random is white and odd number.

A. 5

B. $\frac{1}{5}$

C. 6

D. $\frac{1}{6}$

Answer: B



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14. If 12 identical balls are to be placed in 3 identical boxes, then the probability that one of the boxes contains exactly 3 balls is

A. $\frac{55}{3} \left(\frac{2}{3}\right)^{11}$

B. $55 \left(\frac{2}{3}\right)^{10}$

C. $220 \left(\frac{1}{3}\right)^{12}$

D. $22 \left(\frac{11}{3}\right)^{11}$

Answer: A



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Objective Type Questions Fill In The Blanks

1. If $\frac{3}{11}$ is the probability of an event A, then the probability of the event not A is.....



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2. Odds in favour of occurrences of an event are 5:13, the probability that it will occur is..

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3. The possibility that a non-leap year has 53 sundays, is

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4. For any two events A and B $P(A \cup B) = P(A) + P(B) - \dots\dots\dots$

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5. If A and B are mutually exclusive events, then $P(A \cup B) = \dots\dots\dots$

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1. If A and B are two mutually exclusive events, then, $P(A) + P(B) = .$

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2. For any two events A and B.

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3. If A, B, C are three events associated with a random experiment prove that

$$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap C) - P(B \cap C) + P(A \cap B \cap C)$$

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4. The probability of an impossible event is 0 (b) 1 (c) 1/2 (d) non-existent

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5. If $P(A) = \frac{1}{3}$, $P(B) = \frac{2}{3}$, then A and B are mutually exclusive and exhaustive events.

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Objective Type Questions Very Short Answer Type Questions

1. Mutually exclusive events

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2. Define a simple event. Give an example.

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3. If A and B are events such that $P(A) = 0.42$, $P(B) = 0.48$ and $P(A \text{ and } B) = 0.6$. Determine

(i) $P(\text{not } A)$ (ii) $P(A \text{ or } B)$.



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4. Three coins are tossed once. Find the probability of getting

(i) 3 heads (ii) 2 heads

(iii) 3 tails.



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5. What is the probability of getting a jack from a pack of 52 cards?



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6. Find the probability of getting (drawing) red king from a pack of 52 cards.



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7. If a coin is tossed three times, find the sample space.

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8. Describe a sample space, if a die is thrown two times.

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9. Describe a sample space, if a coin is tossed four times.

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10. Given $P(A) = \frac{3}{5}$ and $P(B) = \frac{1}{5}$. Find $P(A \text{ or } B)$, if A and B are mutually exclusive events.

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11. Given that $P(A) = 0.5$, $P(B) = 0.35$, $P(A \cup B) = 0.7$ find $P(A \cap B)$.

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12. Given $P(A) = \frac{1}{3}$, $P(B) = \frac{1}{5}$ and $P(A \cap B) = \frac{1}{15}$ find $P(A \cup B)$.

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13. Select two persons from a group of 3 boys and 2 girls. Describe the sample space.

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14. A coin is tossed once. Write its sample space. Find the total number of events.

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15. A and B are two mutually exclusive events for which $P(A) = 0.3$, $P(B) = p$ and $P(A \cup B) = 0.5$. Find the value of p .



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Ncert File Exercise 16 1

1. The coin is tossed three times.



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2. A die is thrown two times.



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3. Describe the sample space for the indicated experiment : A coin is tossed four times.

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4. A coin is tossed and a die is thrown

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5. Describe the sample space for the indicated experiment : A coin is tossed and then a die is rolled only in case a head is shown on the coin.

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6. 2 boys and 2 girls are in Room X and 1 boy and 3 girls in Room Y. Specify the sample space for the experiment in which a room is selected and then a person.



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7. Describe the sample space for the indicated experiment : One die of red colour, one of white colour and one of blue colour are placed in a bag. One die is selected at random and rolled, its colour and the number on its uppermost face is noted



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8. An experiment consists of recording boy-girl composition of families with 2 children. (i) What is the sample space if we are interested in knowing whether it is a boy or girl in the order of their births? (ii) What is the sample space if we are



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9. A box contains 1 red and 3 identical white balls. Two balls are drawn at random in succession without replacement. Write the sample space for

this experiment.

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10. An experiment consists of tossing a coin and then throwing it second time if a head occurs. If a tail occurs on the first toss, then a die is rolled once. Find the sample space.

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11. Suppose 3 bulbs are selected at random from a lot. Each bulb is tested and classified as defective (D) or non defective (N). Write the sample space of this experiment.

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12. A coin is tossed. If the outcome is a head, a die is thrown. If the die shows up an even number, the die is thrown again. What is the sample

space for the experiment?



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13. The numbers 1,2,3 and 4 are written separately on four slips of paper. The slips are put in a box mixed thoroughly. A person draws two slips from the box, one after the other without replacement. Describe the sample space for the experiment.



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14. An experiment consists of rolling a die and the tossing a coin once if the number on the die is even.If the number on the die is odd, the coin is tossed twice. Write the sample space for this experiment.



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15. A coin is tossed. If it shows a tail, we draw a ball from a box which contains 2 red and 3 black balls. If it shows head, we throw a die. Find the sample space for this experiment.



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16. A die is thrown repeatedly until a six comes up. What is the sample space for this experiment?



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Ncert File Exercise 16.2

1. A die is rolled. Let E be the event die shows 4 and F be the event die shows even number. Are E and F mutually exclusive?



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2. A die is thrown. Describe the following events: (i) A : a number less than 7 (ii) B : a number greater than 7 (iii) C : a multiple of 3 (iv) D : a number less than 4 (v) E : a even number greater than 4 (vi) F : a number not less than 3 Also find \bar{A}

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3. An experiment involves rolling a pair of dice and recording the numbers that come up. Describe the following events: A: the sum is greater than 8, B: 2 occurs on either die C: the sum is at least 7 and a multiple of 3. Which pairs of these events

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4. Three coins are tossed once. Let A denote the event "three heads show", B denote the event "two heads and one tail show", C denote the event three tails show and D denote the event "a head shows on the first coin". Which events are (i) mutually e

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5. Three coins are tossed. Describe (i) Two events which are mutually exclusive. (ii) Three events which are mutually exclusive and exhaustive. (iii) Two events, which are not mutually exclusive. (iv) Two events which are mutually exclusive but not exhaustiv

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6. Two dice are thrown. The events A, B and C are as follows:A : getting an even number on the first die.B : getting an odd number on the first die.C : getting the sum of the numbers on the dice 5.Describe the events(i) A' (ii) not B(

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1. Which of the following cannot be valid assignment of probability for elementary events or outcomes of samples space

$S = \{w_1, w_2, w_3, w_4, w_5, w_6, w_7\}$: Elementary events $w_1 w_2 w_3 w_4 w_5$

$w_6 w_7$ i. 0.1 0.01 0.05 0.03 0.01 0.2 0.6 ii. $\frac{1}{7} \frac{1}{7} \frac{1}{7} \frac{1}{7} \frac{1}{7} \frac{1}{7} \frac{1}{7}$ iii. 0.7 0.6 0.5

0.4 0.3 0.2 0.1 iv. $\frac{1}{14} \frac{2}{14} \frac{3}{14} \frac{4}{14} \frac{5}{14} \frac{6}{14} \frac{15}{14}$



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2. A coin is tossed twice, what is the probability that atleast one tail occurs?



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3. A die is thrown, find the probability of following events:

(i) A prime number will appear,

(ii) A number greater than or equal to 3 will appear,

(iii) A number less than or equal to one will appear,

(iv) A number more than 6 will appear,

(v) A number less than 6 will appear.



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4. A card is selected from a pack of 52 cards.

(a) How many points are there in the sample space?

(b) Calculate the probability that the card is an ace of spades.

(c) Calculate the probability that the card is (i) an ace (ii) black card.



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5. A fair coin with 1 marked on one face and 6 on the other and a fair die are both tossed. Find the probability that the sum of numbers that turn up is (i) 3 (ii) 12.



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6. There are four men and six women on the city council. If one council member is selected for a committee at random how likely is it that it is a woman?



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7. A fair coin is tossed four times, and people win Re 1 for each head and lose Rs 1.50 for each tail that turns up. From the sample space calculate how many different amounts of money you can have after four tosses and the probability of having each



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8. Three coins are tossed once. Find the probability of getting (i) 3 heads (ii) 2 heads (iii) at least 2 heads (iv) at most 2 heads (v) no head (vi) 3 tails (vii) exactly two tails (viii) no tail (ix) at most two tails



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9. If $\frac{5}{11}$ is the probability of an event what is the probability of the event not A?

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10. A letter is chosen at random from the word ASSASSINATION. Find the probability that letter is (i) a vowel (ii) a consonant.

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11. In a lottery, a person chooses six different natural numbers at random from 1 to 20, and if these six numbers match with the six numbers already fixed by the lottery committee, he wins the prize. What is the probability of Winning the prize in the

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12. Check whether the following probabilities $P(A)$ and $P(B)$ the consistently defined:

(i) $P(A) = 0.5, P(B) = 0.7, P(A \cap B) = 0.06$

(ii) $P(A) = 0.5, P(B) = 0.4, P(A \cup B) = 0.8$

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13. Fill in the blanks in following table:

	$P(A)$	$P(B)$	$P(A \cap B)$	$P(A \cup B)$
(i)	$\frac{1}{3}$	$\frac{1}{5}$	$\frac{1}{15}$...
(ii)	0.35	...	0.25	0.6
(iii)	0.5	0.35	...	0.8

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14. Given $P(A) = \frac{3}{5}$ and $P(B) = \frac{1}{5}$. Find $P(A \text{ or } B)$, if A and B are mutually exclusive events.

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15. If E and F are events such that $P(E) = \frac{1}{4}$, $P(F) = \frac{1}{2}$ and $P(E \text{ and } F) = \frac{1}{8}$, find (i) $P(E \text{ or } F)$ (ii) $P(\text{not } E \text{ and not } F)$.

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16. Events E and F are such that $P(\text{not } E \text{ or not } F) = 0.25$. State whether E and F are mutually exclusive.

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17. A and B are events such that $P(A) = 0.42$, $P(B) = 0.48$ and $P(A \text{ and } B) = 0.16$. Determine (i) $P(\text{not } A)$, (ii) $P(\text{not } B)$ and (iii) $P(A \text{ or } B)$

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18. In Class XI of a school 40% of the students study Mathematics and 30% study Biology. 10% of the class study both Mathematics and Biology.

If a student is selected at random from the class, find the probability that he will be studying Mathematics

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19. In an entrance test that is graded on the basis of two examinations, the probability of a randomly chosen student passing the first examination is 0.8 and the probability of passing the second examination is 0.7. The probability of passing at least one of them is 0.95. What is the probability of passing both?

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20. The probability that a student will pass the final examination in both English and Hindi is 0.5 and the probability of passing neither is 0.1. If the probability of passing the English examination is 0.75, what is the probability of passing the Hi

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21. In a class of 60 students, 30 opted for NCC, 32 opted for NSS and 24 opted for both NCC and NSS. If one of these students is selected at random, find the probability that (i) The student opted for NCC or NSS. (ii) The student has opted neither

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Miscellaneous Exercise On Chapter

1. A box contains 10 red marbles, 20 blue marbles and 30 green marbles. 5 marbles are drawn from the box, what is the probability that:

(i) all will be blue?

(ii) at least one will be green?

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2. 4 cards are drawn from a well - shuffled deck of 52 cards. What is the probability of obtaining 3 diamonds and one spade?

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3. A die has two faces each with number 1 three faces each with number 2 and one face with number 3. If die is rolled once, determine (i) $P(2)$ (ii) $P(1 \text{ or } 3)$ (iii) $P(\text{not } 3)$

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4. In a lottery 10,000 tickets are sold and ten equal prizes are awarded. What is the probability of not getting a prize if you buy i. 1 ticket ii. two tickets iii. 10 tickets.

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5. Out of 100 students, two sections of 40 and 60 are formed. If you and your friend are among the 100 students, what is the probability that (a) you both enter the same section? (b) you both enter the different sections?

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6. Out of 100 students, two sections of 40 and 60 are formed. If you and your friend are among the 100 students, what is the probability that (a) you both enter the same section? (b) you both enter the different sections?

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7. Three letters are dictated to three persons and an envelope is addressed to each of them, the letters are inserted into the envelopes at random so that each envelope contains exactly one letter. Find the probability that at least one letter is in



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8. A and B are two events such that $P(A) = 0.54$, $P(B) = 0.69$ and $P(A \cap B) = 0.35$.

Find (i) $P(A \cup B)$ (ii) $P(A' \cap B')$ (iii) $P(A' \cap B)$

(iv) $P(B \cap A')$



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9. From the employees of a company, 5 persons are selected to represent them in the managing committee of the company. Particulars of five persons are as follows:

S.No.	Name	Sex	Age in years
1.	Harish	M	30
2.	Rohan	M	33
3.	Sheetal	F	46
4.	Alis	F	28
5.			



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10. If 4-digit numbers greater than 5,000 are randomly formed from the digits 0, 1, 3, 5, and 7. what is the probability of forming a number divisible

by 5 when, (i) the digits are repeated? (ii) the repetition of digits is not allowed?



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11. The number lock of a suitcase has 4 wheels, each labelled with ten digits i.e., from 0 to 9. The lock opens with a sequence of four digits with no repeats. What is the probability of a person getting the right sequence to open the suitcase?



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Questions From Ncert Exemplar

1. A card is picked up from a deck of 52 playing cards. What is the sample space of the experiment? What is the event that the chosen card is black faced card?



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2. Suppose each child born is equally likely to be a boy or a girl. Consider the family with exactly three children. List the eight elements in the sample space whose outcome are all possible gender of three children. Write each of the following events as a set and find its probability: The event that exactly one child is girl. The event that at least two children are girls. The event that no child is a girl.

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3. a. How many two digit positive integers are multiples of 3?
b. What is the probability that a randomly chosen two digit positive integer is a multiple of 3?

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4. An experiment has four possible outcomes A, B, C and D that are mutually exclusive. Explain why the following assignments of probability

are not permissible,

a. $P(A) = 0.12, P(B) = 0.63, P(C) = 0.45, P(D) = -0.20$

b. $P(A) = \frac{9}{120}, P(B) = \frac{45}{120}, P(C) = \frac{27}{120}, P(D) = \frac{46}{120}$



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5. An urn contains twenty white slips of paper numbered from 1 through 20, ten red slips of paper numbered from 1 through 10, forty yellow slips of paper numbered from 1 through 40, and ten blue slips of paper numbered from 1 through 10. If these 80 slips of paper are thoroughly shuffled so that each slip has the same probability of being drawn. Find the probability of drawing slip of paper that is:

a. blue or white

b. numbered 1, 2, 3, 4 or 5

c. red or yellow and numbered 1, 2, 3, or 4

d. white and numbered higher than 12 or yellow and numbered higher than 26.



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1. A die is loaded in such a way that a way that each odd number is twice as likely to occur as each even number. Find $P(G)$, where G is the event that a number greater than 3 occurs on a single roll of the die.

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2. If A and B are mutually exclusive events, $P(A)=0.35$ and $P(B)=0.45$, then find

(i) $P(A')$

(ii) $P(B')$

(iii) $P(A \cup B)$

(iv) $P(A \cap B)$

(v) $P(A \cap B')$

(vi) $P(A' \cup B')$

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3. Four candidates A, B, C, D have applied for the assignment of coach of a school cricket team. If A is twice as likely to be selected as B, and B and C are given about the same chance of being selected, while C is twice as likely to be selected as D, what are the probability that (i) C will be selected ? (ii) A will not be selected?



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4. A bag contain 8 red and 5 white balls. Three balls are drawn at random. Find the probability that: All the three balls are white. All the three balls are red. One ball is red and two balls are white.



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5. A sample space consists of 9 elementary outcomes E_1, E_2, \dots, E_9 whose probabilities are

$$P(E_1) = P(E_2) = 0.08, P(E_3) = P(E_4) = P(E_5) = 0.1$$

$$P(E_6) = P(E_1) = 0.2, P(E_8) = P(E_9) = 0.07$$

Suppose $A = \{E_1, E_5, E_8\}$, $B = \{E_2, E_5, E_8, E_9\}$

(i) Calculate $P(A)$, $P(B)$ and $P(A \cap B)$.

(ii) Using the addition law of probability, calculate $P(A \cup B)$.

(iii) List the composition of the event $A \cup B$ and calculate $P(A \cup B)$ by adding the probabilities of the elementary outcomes.

Calculate $P(\bar{B})$ from $P(B)$, also calculate $P(\bar{B})$ directly from the elementary outcomes of \bar{B} ,



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Revision Exercise

1. Find the probability that when a hand of 7 cards is drawn from a well shuffled deck of 52 cards, it contains (i) all Kings (ii) 3 Kings (iii) at least 3 Kings.



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2. 4 cards are drawn from a well - shuffled deck of 52 cards. What is the probability of obtaining 3 diamonds and one spade?

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3. A die has two faces each with number 1 three faces each with number 2 and one face with number 3. If die is rolled once, determine (i) $P(2)$ (ii) $P(1 \text{ or } 3)$ (iii) $P(\text{not } 3)$

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4. Out of 100 students, two sections of 40 and 60 are formed. If you and your friend are among the 100 students, what is the probability that (a) you both enter the same section? (b) you both enter the different sections?

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5. A and B are two events such that $P(A) = 0.54$, $P(B) = 0.69$ and $P(A \cap B) = 0.535$.

(i) $P(A \cup B)$ (ii) $P(A' \cap B')$

(iii) $P(A \cap B')$ (iv) $P(B \cap A')$



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6. If 4-digit numbers greater than 5,000 are randomly formed from the digits 0, 1, 3, 5, and 7. what is the probability of forming a number divisible by 5 when, (i) the digits are repeated? (ii) the repetition of digits is not allowed?



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7. On her vacations Veena visits four cities A, B, C and D in a random order. What is the probability that she visits: a. A before B? b. A before B and B before C? c. A first and B last? d. A either first or second? e. A just before B?



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8. In a relay race there are five teams A, B, C, D and E. (a) What is the probability that A, B and C finish first, second and third, respectively. (b) What is the probability that A, B and C are first three to finish (in any order) (Assume t



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Check Your Understanding

1. Two coins are tossed simultaneously. Write the sample space S and the number of sample points $n(S)$.



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2. Equally Likely Events



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3. A coin tossed and then a die is thrown. Describe the sample space for this experiment.



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4. Mutually exclusive events



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5. When A is a sure event, then what is $P(A)$?



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6. When A is an impossible event, then what is $P(A)$?



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7. If A and B are mutually exclusive events, then $P(A \cup B) =$

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8. For any two events A and B $P(A \cup B) =$

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9. For any three events A, B and C, $P(A \cup B \cup C) = \dots\dots\dots$

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10. Check whether the following probabilities $P(A)$ and $P(B)$ are consistently defined

(i) $P(A) = 0.5, P(B) = 0.7, P(A \cap B) = 0.6$

(ii) $P(A) = 0.5, P(B) = 0.4, P(A \cup B) = 0.8$

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Chapter Test

1. In a non-leap year, the probability of having 53 Tuesday or 53 Wednesday is

A. $\frac{1}{7}$

B. $\frac{2}{7}$

C. $\frac{3}{7}$

D. None of these

Answer: A



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2. When a coin is tossed two times, the number of possible outcomes is:

A. 2

B. 4

C. 6

D. 8

Answer: B



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3. An event 'E' is defined as getting both heads or both tails in a throw of two coins, then find $P(E)$



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4. Given $P(A) = \frac{3}{5}$ and $P(B) = \frac{1}{5}$. Find $P(A \text{ or } B)$, if A and B are mutually exclusive events.



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5. If 'E' is the event that a non leap year have fifty three Sundays, Find $P(E)$.



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6. A pair of dice is thrown. Find the following events:

(i) Same numbers on both the dice (ii) The sum is greater than 10.

(iii) Even number on both the dice (iv) Odd numbers on both the dice

(v) The sum is 7.



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7. Two dice are thrown together. What is the probability of getting a doublet?



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8. Two dice are thrown. Find the odds in favour of getting the sum i. 4 ii. 5
iii. what are the odds against getting the sum 6?

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9. A, B, C are three mutually exclusive and exhaustive events associated with a random experiment. Fine $P(A)$, it being given that $P(B) = \frac{3}{2}P(A)$ and $P(C) = \frac{1}{2}P(B)$.

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10. A and B are two events such that

$$P(A) = 0.54, P(B) = 0.69 \text{ and } P(A \cap B) = 0.35$$

Find (i) $P(A \cup B)$ (ii) $P(A' \cap B')$

(iii) $P(A \cap B')$ (iv) $P(B \cap A')$

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11. An experiment has four possible outcomes. A,B,C and D that are mutually exclusive. Explain why the following assignments of probability are not permissible

(i) $P(A) = 0.12, P(B) = 0.63, P(C) = 0.45, P(D) = -0.20$

(ii) $P(A) = \frac{9}{120}, P(B) = \frac{45}{120}, P(C) = \frac{27}{120}, P(D) = \frac{46}{120}$



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12. If 4-digit numbers greater than 5,000 are randomly formed from the digits 0, 1, 3, 5, and 7. what is the probability of forming a number divisible by 5 when, (i) the digits are repeated? (ii) the repetition of digits is not allowed?



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