



MATHS

BOOKS - SURA MATHS (TAMIL ENGLISH)

INTRODUCTION OF PROBABILITY THEOREM

Exercise 12 1

1. An experiment has the four possible mutually exclusive and exhaustive outcomes A,B,C and D. Check whether the following assignments of probability are permissible.(i)

$$P(A) = 0.15, P(B) = 0.30, P(C) = 0.43, P(D) = 0.12$$

$$(ii) P(A) = 0.22, P(B) = 0.38, P(C) = 0.16, P(D) = 0.34$$

$$(iii) P(A) = \frac{2}{5}, P(B) = \frac{3}{5}, P(C) = -\frac{1}{5}, P(D) = \frac{1}{5}$$

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2. If two coins are tossed simultaneously, then find the probability of getting

(i) one head and one tail

(ii) at most two tails



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3. Five mangoes and 4 apples are in a box. If two fruits are chosen at random, find the probability that

(i) one is a mango and the other is an apple

(ii) both are of the same variety.



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4. A year is selected at random. What is the probability that

(i) it contains 53 Sundays

(ii) it is a leap year which contains 53 Sundays



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5. Eight coins are tossed once, find the probability of getting

(i) exactly two tails

(ii) at least two tails

(iii) at most two tails



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6. An integer is chosen at random from the first 100 positive integers.

What is the probability that the integer chosen is a prime or multiple of 8?



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7. A bag contains 7 red and 4 black balls, 3 balls drawn at random.

Find the probability that

(i) all are red

(ii) one red and 2 black.



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8. A single card is drawn from a pack of 52 cards. What is the probability that (i)the card is an ace or a king ,(ii)the card will be 6 or smaller, (iii)the card is either a queen or 9?



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9. A cricket club has 16 members, of whom only 5 can bowl . What is the probability that in a team of 11 members at least 3 bowlers are selected?



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10.

- (i) The odds that the event A occurs is 5 or 7, find $P(A)$.
- (ii) Suppose $P(B) = \frac{2}{5}$. Express the odds that the event B occurs.



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Exercise 12 2

1. If A and B are mutually exclusive events

$P(A) = \frac{3}{8}$ and $P(B) = \frac{1}{8}$, then find

- (i) $P(\bar{A})$ (ii) $P(A \cup B)$ (iii) $P(\bar{A} \cap B)$ (iv) $P(\bar{A} \cup \bar{B})$



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2. If A and B are two events associated with a random experiment for which $P(A) = 0.35$, $P(A \text{ or } B) = 0.85$, and $P(A \text{ and } B) = 0.15$. Find

- (i) $P(\text{only } B)$ (ii) $P(\bar{B})$ (iii) $P(\text{only } A)$

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3. A die is thrown twice. Let A be the event, 'First die shows 5' and B be the event, 'second die shows 5'. Find $P(A \cup B)$.

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4. The probability of an event A occurring is 0.5 and B occurring is 0.3. If A and B are mutually exclusive events, then find the probability of

(i) $P(A \cup B)$ (ii) $P(A \cap \bar{B})$ (iii) $P(\bar{A} \cap B)$.

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5. A town has 2 fire engines operating independently. The probability that a fire engine is available when needed is 0.96.

(i) What is the probability that a fire engine is available when needed

?

(ii) What is the probability that neither is available when needed ?



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6. The probability that a new railway bridge will get an award for its design is 0.48, the probability that it will get an award for the efficient use of materials is 0.36, and that it will get both awards is 0.2. What is the probability, that

(i) it will get at least one of the awards

(ii) it will get only one of the awards.



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Exercise 12 3

1. Can two events be mutually exclusive and independent simultaneously?

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2. If A and B are two events such that $P(A \cup B) = 0.7$, $P(A \cap B) = 0.2$, and $P(B) = 0.5$, then show that A and B are independent.

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3. If A and B are two independent events such that $P(A \cup B) = 0.6$, $P(A) = 0.2$, find $P(B)$.

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4. If $P(A) = 0.5$, $P(B) = 0.8$ and $P(B/A) = 0.8$, find $P(A/B)$ and $P(A \cup B)$.

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5. If for two events A and B , $P(A) = \frac{3}{4}$, $P(B) = \frac{2}{5}$ and $A \cup B = S$ (sample space), find the conditional probability $P(A/B)$.

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6. A problem in Mathematics is given to three students whose chances of solving it are $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{5}$

(i) What is the probability that the problem is solved ?

(ii) What is the probability that exactly one of them will solve it ?

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7. The probability that a car being filled with petrol will also need an oil change is 0.30, the probability that both the oil and filter need changing is 0.15.

(i) If the oil had to be changed, what is the probability that a new oil filter is needed ?

(ii) If a new oil filter is needed, what is the probability that the oil has to be changed ?



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8. One bag contains 5 white and 3 black balls, Another bag contains 4 white and 6 black balls. If one ball is drawn from each bag, find the probability that

(i) both are white

(ii) both are black

(iii) one white and one black.

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9. Two thirds of students in a class are boys and rest girls. It is known that the probability of a girls. It is known that the probability of a girl getting a first grade is 0.85 and that of boys is 0.70. Find the probability that a student chosen at random will get first grade marks.

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10. Given $P(A) = 0.4$ and $P(A \cup B) = 0.7$. Find $P(B)$ if

- (i) A and B are mutually exclusive
- (ii) A and B are independent events
- (iii) $P(A/B) = 0.4$
- (iv) $P(B/A) = 0.5$

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11. A year is selected at random. What is the probability that
- (i) it contains 53 Sundays
 - (ii) it is a leap year which contains 53 Sundays



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12. Suppose the chances of hitting a target by a person X is 3 times in 4 shots, by Y is 4 times in 5 shots, and by Z is 2 times in 3 shots. They fire simultaneously exactly one time. What is the probability that the target is damaged by exactly 2 hits ?



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Exercise 12 4

1. A factory has two Machines - I and II. Machine-I produced 60 % of items and Machine - II produces 40 % of the items of the total

output. Further 2% of the items produced by Machine - I are defective whereas 4% produced by Machine - II are defective. If an item is drawn at random what is the probability that it is defective ?



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2. There are two identical urns containing respectively 6 black and 4 red balls, 2 black and 2 red balls. An urn is chosen at random and a ball is drawn from it.

(i) find the probability that the ball is black

(ii) if the ball is black, what is the probability that it is from the first urn ?



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3. A firm manufactures PVC pipes in three plants viz, X, Y and Z. The daily production volumes from the three firm X, Y and Z are

respectively 2000 units, 3000 units and 5000 units. It is known from the past experience that 3 % of the output from plant X, 4 % from plant Y and 2 % from plant Z are defective. A pipe is selected at random from a day's total production

- (i) find the probability that the selected pipe is defective one.
- (ii) If the selected pipe is a defective, then what is the probability that it was produced by plant Y ?



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4. The chances of A, B and C becoming manager of a certain company are 5 : 3 : 2. The probabilities that the office canteen will be improved if A, B and C become managers are 0.4, 0.5 and 0.3 respectively. If the office canteen has been improved, what is the probability that B was appointed as the manager ?



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5. An advertising executive is studying television viewing habits of married men and women during prime time hours. Based on the past viewing records he has determined that during prime time wives are watching television 60 % of the time. It has also been determined that when the wife is watching television, 40 % of the time the husband is also watching. When the wife is not watching the television, 30 % of the time the husband is watching the television. Find the probability that (i) the husband is watching the television during the prime time of television, the wife is also watching the television.



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Additional Problem Section B

1. A die is rolled. If the outcome is an even number, what is the probability that it is a prime number ?



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2. Two unbiased die are thrown. Find the probability that the sum is 8 or greater if 3 appears on the first die.

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3. The probability that a student selected at random from a class will pass in Mathematics is $\frac{2}{3}$ and the probability that he passes in Mathematics and English is $\frac{1}{3}$. What is the probability that he will pass in English if it is known that he has passed in Mathematics ?

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4. Two cards are drawn at random and without replacement from a pack of 52 playing cards. Find the probability that both the cards are black.

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Additional Problem Section C

1. A basket contains 20 apples and 10 oranges out of which 5 apples and 3 oranges are defective. If a person takes out 2 at random what is the probability that either are apples or both are good ?

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2. A fair dice is rolled. Consider the following events

$A = \{1, 3, 5\}$, $B = \{2, 3\}$ and $C = \{2, 3, 4, 5\}$ Find (i)

$P(A/B)$ and $P(B/A)$ (ii) $P(A \cap B/C)$

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3. A and B are two events such that $P(A) \neq 0$. Find $P(B/A)$ if (i) A is a subset of B (ii) $A \cap B = \phi$

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4. Two dice are tossed, Find whether the following events A and B are independent.

$A = \{(x, y) : x + y = 11\}$, $B = \{(x, y) : x \neq 5\}$. Where (x, y) denote a typical sample point.

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Additional Problem Section D

1. A couple has two children. Find the probability that

(i) both the children are boys, if it is known that the older child is a

boy.

(ii) both the children are girls, if it is known that the older child is a girl.



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2. Two integers are selected at random from integers 1 to 11. If the sum is even, find the probability that both the numbers are odd.



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3. Evaluate $P(A \cup B)$ if $2P(A) = P(B) = \frac{5}{13}$ and $P(A/B) = \frac{2}{5}$.



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4. In answering a question on a multiple choice test, a student either knows the answer or guesses. Let $\frac{3}{4}$ be the probability that he

knows the answer and $\frac{1}{4}$ be the probability that he guesses.

Assuming that a student who guesses at the answer will be correct with probability $\frac{1}{4}$. What is the probability that the student knows the answer given that he answered it correctly ?



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5. An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probability of an accident are 0.01, 0.03 and 0.15 respectively. One of the insured person meets with an accident. What is the probability that he is a scooter driver ?



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Exercise 12 5

1. Four persons are selected at random from a group of 3 men, 2 women and 4 children. The probability that exactly two of them are children is

A. $\frac{3}{4}$

B. $\frac{10}{23}$

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

D. $\frac{10}{21}$

Answer: A::B::D



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2. A number is selected from the set $\{1, 2, 3, \dots, 20\}$. The probability That the selected number is divisible by 3 or 4 is

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

B. $\frac{1}{8}$

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

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

Answer: A::B::C



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3. A, B and C try to hit a target simultaneously but independently.

Their respective probabilities of hitting the target are $\frac{3}{4}$, $\frac{1}{2}$, $\frac{5}{8}$. The

probability that the target is hit by A or B but not by C is

A. $\frac{21}{64}$

B. $\frac{7}{32}$

C. $\frac{9}{64}$

D. $\frac{7}{8}$

Answer: A::B::D



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4. If A and B are any two events, then the probability that exactly one of them occur is

A. $P(A \cup \overline{B}) + P(\overline{A} \cup B)$

B. $P(A \cap \overline{B}) + P(\overline{A} \cap B)$

C. $P(A) + P(B) - P(A \cap B)$

D. $P(A) + P(B) + 2P(A \cap B)$

Answer: A::B



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5. Let A and B be two events such that $P(\overline{A \cup B}) = \frac{1}{6}$, $P(A \cap B) = \frac{1}{4}$ and $P(\overline{A}) = \frac{1}{4}$. Then the events A and B are

- A. Equally likely but not independent
- B. Independent but not equally likely
- C. Independent and equally likely
- D. Mutually inclusive and dependent

Answer: A::B::C::D



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6. Two items are chosen from a lot containing twelve items of which four are defective, then the probability that at least one of the item is defective

A. $\frac{19}{33}$

B. $\frac{17}{33}$

C. $\frac{23}{33}$

D. $\frac{13}{33}$

Answer: A::C



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7. A man has 3 fifty rupees notes, 4 hundred rupees notes and 6 five hundred rupees notes in his pocket. If 2 notes are taken at random, what are the odds in favour of both notes being of hundred rupee denomination ?

A. 1: 12

B. 12: 1

C. 13: 1

D. 1: 13

Answer: A::B



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8. A letter is taken at random from the letters of the word 'ASSISTANT' and another letter is taken at random from the letters of the word 'STATISTICS'. The probability that the selected letters are the same is

A. $\frac{7}{45}$

B. $\frac{17}{90}$

C. $\frac{29}{90}$

D. $\frac{19}{90}$

Answer: A::D



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9. A matrix is chosen at random from a set of all matrices of order 2, with elements 0 or 1 only. The probability that the determinant of the matrix chosen is non zero will be

A. $\frac{3}{16}$

B. $\frac{3}{8}$

C. $\frac{1}{4}$

D. $\frac{5}{8}$

Answer: B::C



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10. A bag contains 5 white and 3 black balls. Five balls are drawn successively without replacement. The probability that they are

alternately of different colours is

A. $\frac{3}{14}$

B. $\frac{5}{14}$

C. $\frac{1}{14}$

D. $\frac{9}{14}$

Answer: A::C::D



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11. If A and B are two events such that $A \subset B$ and $P(B) \neq 0$, then which of the following is correct ?

A. $P(A/B) = \frac{P(A)}{P(B)}$

B. $P(A/B) < P(A)$

C. $P(A/B) \geq P(A)$

D. $P(A/B) > P(B)$

Answer: A::B::C



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12. A bag contains 6 green, 2 white, and 7 black balls. If two balls are drawn simultaneously, then the probability that both are different colours is

A. $\frac{68}{105}$

B. $\frac{71}{105}$

C. $\frac{64}{105}$

D. $\frac{73}{105}$

Answer: A



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13. If X and Y be two events such that $P(X/Y) = \frac{1}{2}$, $P(Y/X) = \frac{1}{3}$ and $P(X \cap Y) = \frac{1}{6}$, then $P(X \cup Y)$ is

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

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

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

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

Answer: B::C::D



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14. An urn contains 5 red and 5 black balls. A ball is drawn at random, its colour is noted and is returned to the urn. Moreover, 2 additional balls of the colour drawn are put in the urn and then a ball is drawn at random. The probability that the second ball drawn is red will be

A. $\frac{5}{12}$

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

C. $\frac{7}{12}$

D. $\frac{1}{4}$

Answer: A::B



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15. A number x is chosen at random from the set $\{1, 2, 3, 4, \dots, 100\}$. Define the event : A = the chosen number

x satisfies $\frac{(x - 10)(x - 50)}{(x - 30)} \geq 0$, then $P(A)$ is

A. 0.20

B. 0.51

C. 0.71

D. 0.70

Answer: A::C



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16. If two events A and B are independent such that $P(A) = 0.35$ and $P(A \cup B) = 0.6$, then $P(B)$ is

A. $\frac{5}{13}$

B. $\frac{1}{13}$

C. $\frac{4}{13}$

D. $\frac{7}{13}$

Answer: A::C



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17. If two events A and B are such that

$$P(\bar{A}) = \frac{3}{10} \text{ and } P(A \cap \bar{B}) = \frac{1}{2}, \text{ then } P(A \cap B) \text{ is}$$

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

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

C. $\frac{1}{4}$

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

Answer: A::D



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18. If A and B are two events such that

$$P(A) = 0.4, P(B) = 0.8 \text{ and } P(B/A) = 0.6, \text{ then } P(\bar{A} \cap B) \text{ is}$$

A. 0.96

B. 0.24

C. 0.56

D. 0.66

Answer: C



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19. There are three events A, B and C of which one and only one can happen. If the odds are 7 to 4 against A and 5 to 3 against B, then odds against C is

A. 23: 65

B. 65: 23

C. 23: 88

D. 88: 33

Answer: B::C

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20. If a and b are chosen randomly from the set $\{1, 2, 3, 4\}$ with replacement, then the probability of the real roots of the equation $x^2 + ax + b = 0$ is

A. $\frac{3}{16}$

B. $\frac{5}{16}$

C. $\frac{7}{16}$

D. $\frac{11}{16}$

Answer: A::C

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21. It is given that the events A and B are such that $P(A) = \frac{1}{4}$, $P(A/B) = \frac{1}{2}$ and $P(B/A) = \frac{2}{3}$. Then $P(B)$ is

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

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

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

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

Answer: A::B::C



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22. In a certain college 4% of the boys and 1 % of the girls are taller than 1.8 meter. Further 60% of the students are girls. If a student is selected at random and is taller than 1.8 meters, then the probability that the student is a girl is

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

B. $\frac{3}{11}$

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

D. $\frac{7}{11}$

Answer: A::B::C



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23. Ten coins are tossed. The probability of getting at least 8 heads is

A. $\frac{7}{64}$

B. $\frac{7}{32}$

C. $\frac{7}{16}$

D. $\frac{7}{128}$

Answer: A::B::D



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24. The probability of two events A and B are 0.3 and 0.6 respectively. The probability that both A and B occur simultaneously is 0.18. The probability that neither A nor B occurs is

- A. 0.1
- B. 0.72
- C. 0.42
- D. 0.28

Answer: B::D



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25. If m is a number such that $m \leq 5$, then the probability that quadratic equation $2x^2 + 2mx + m + 1 = 0$ has real roots is

- A. $\frac{1}{5}$

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

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

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

Answer: C



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Additional Problems Section A

1. A and B are two events such that $P(A) = 0.25$ $P(B) = 0.50$. The probability of both happening together is 0.14. The probability of both A and B not happening is

A. 0.39

B. 0.25

C. 0.11

D. none of these

Answer: A::C



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2. A coin is tossed three times. If events A and B are defined as A = Two heads occurs B = Last should be head. Then A and B are

A. Independent

B. dependent

C. both

D. mutually exclusive

Answer: B



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3. If S is the sample space, $P(A) = \frac{1}{3}P(B)$ and $S = A \cup B$, where A and B are mutually exclusive events then $P(A) =$

A. $\frac{1}{4}$

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

C. $\frac{3}{4}$

D. $\frac{3}{8}$

Answer: A::D



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4. If $P(A \cup B) = 0.8$ and $P(A \cap B) = 0.3$ then

$$P(\overline{A}) + P(\overline{B}) =$$

A. 0.3

B. 0.5

C. 0.7

D. 0.9

Answer: D



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5. If A and B are two events such that

$P(A) = \frac{4}{5}$ and $P(A \cap B) = \frac{7}{10}$ then $P(B/A) =$

A. $\frac{1}{10}$

B. $\frac{1}{8}$

C. $\frac{7}{8}$

D. $\frac{17}{20}$

Answer: C



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6. If A and B are two events such that

$$P(A \cap B) = \frac{7}{10} \text{ and } P(B) = \frac{17}{20}, \text{ then } P(A/B) =$$

A. $\frac{14}{17}$

B. $\frac{17}{20}$

C. $\frac{7}{8}$

D. $\frac{1}{8}$

Answer: A::D



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7. Two dice are thrown. It is known that the sum of the numbers on the dice was less than 6, the probability of getting a sum 3 is

A. $\frac{1}{18}$

B. $\frac{5}{18}$

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

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

Answer: A::C



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8. Assertion (A) : In rolling die, getting number

Reason (R) : In a die contains only numbers 1, 2, 3, 4, 5, 6

A. Both (A) and (R) are true and (R) is the correct rexplanation of

(A)

B. Both (A) and (R) are true but (R) is not the correct explanation

of (A)

C. (A) is true (R) is false

D. (A) is false (R) is true

Answer: A::D



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9. Choose the incorrect pair :

A. A and B disjoint $P(A \cup B) = P(A) + P(B)$

B. A and B independent $P(A \cap B) = P(A)P(B)$

C. A and B disjoint $P(A \cap B) = 0$

D. A and B independent $P(A/B) = P(B/A)$

Answer: A::B::D



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10. Choose the incorrect pair :

A. $P(A) + P(B) - P(A \cap B)$ Exactly one of them occur

B. $P(A \cap B)$ Simultaneous occurrence of A and B

C.

$P(A) + P(B) - P(A \cap B)$ Occurrence of either A or B both

D. $1 - P(A \cup B)$ Occurrence of only A

Answer: A::B::C::D



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11. Choose the incorrect statement

A. Two events cannot occur simultaneously are mutually exclusive events.

B. Events A_1, A_2, \dots, A_k are exhaustive if

$$A_1 \cup A_2 \cup \dots \cup A_k = S$$

C. Two events having the same chance of occurrences are called equally likely events.

D. Odds related to the chances against an event A to chances in favour of it

Answer: A::C::D



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12. Assertion (A) : ${}_nP_r > {}_nC_r$

Reason ${}_nP_r = {}_nC_r \times r!$

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true but (R) is not the correct explanation of (A)

C. A is true R is false

D. A is false R is true

Answer: A



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13. Choose the correct statement

A. Permutation and Combination are equal

B. Permutation is greater than combination

C. Permutation is lesser than combination

D. Permutation and combination are unrelated

Answer: A::B::C



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14. Assertion (A) : A and B are mutually exclusive events then A and B cannot be independent.

Reason (R) : $P(A \cap B) = 0 \neq P(A)P(B)$.

- A. Both A and R are true and R is the correct explanation of A
- B. Both A and R are true but R is not the correct explanation of A
- C. A is true R is false
- D. A is false R is true

Answer: A::B::C::D



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