



MATHS

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INTRODUCTION TO PROBABILITY THEORY

Worked Examples

1. If an experiment has exactly the three possible mutually exclusive outcomes A, B, C check in each case whether assignment of probability is permissible.

$$(i) P(A) = \frac{1}{3}, P(B) = \frac{1}{3}, P(C) = \frac{1}{3}.$$

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2. If an experiment has exactly the three possible mutually exclusive outcomes A, B, and C, check in each case whether the assignment of probability is permissible.(ii)

$$P(A) = .25, P(B) = .75, P(C) = .25.$$

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3. If an experiment has exactly the three possible mutually exclusive outcomes A, B, and C, check in each case whether the assignment of probability is permissible.(iii)

$$P(A) = .6, P(B) = .5, P(C) = . - 0.1.$$

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4. If an experiment has exactly the three possible mutually exclusive outcomes A, B, and C, check in each case whether the

assignment of probability is permissible.(iv)

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



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5. If an experiment has exactly the three possible mutually exclusive outcomes A, B, and C, check in each case whether the assignment of probability is permissible.(v)

$$P(A) = .23, P(B) = .52, P(C) = .25.$$



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6. Two coins are tossed simultaneously .What is the probability of getting:

(i)Exactly one tail

(ii)Atleast one tail

(iii)At most one tail .



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7. An integer is chosen at random from the first 20 positive integers. Find the probability that it

- (i) An even number
- (ii) Divisible by 5
- (iii) A prime number.



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8. If 4 coins are tossed simultaneously, find the probability of getting

- (i) Exactly 3 heads
- (ii) At least 3 heads
- (iii) At most 3 heads.



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9. A fair dice is rolled. Find the probability of getting

(i) A number less than 4

(ii) Odd number

(iii) Number greater than N equal to 4.

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10. When a pair of balanced dice are rolled. What are the probability of getting the sum

(i) 6 (ii) 6 or 8 (iii) 6 or 12.

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11. Three persons A, B, C take part in a competition. A is 4 times as likely as B to win, and B is thrice as likely as C to win. Find the

probability of A,B,C to win the competition.



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12. If x,y,z are chosen at random from the set $(1,2,3)$ (repetition is allowed) .What is the probability that the equation $x^2 - yz \geq 0$ is satisfied.



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13. Three students A,B,C stand one behind other in a row to take a part in a march -past.There are 5 different colour flags are there. Each student is to carry a flag such that on two students should carry the flag of the same colour.Find the probability that the first student should carry white flag where white is one of the 5 colours.



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14. Three balls are to be chosen from a box containing 3 red, 2 white and 4 blue balls. Find the probability that all the three balls are of different colour.



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15. A basket contains 2 blue flowers, 4 red flowers and 6 white flowers. If two flowers are drawn chosen at random, what are the odds in favour of both flowers being red flowers and also its probability.



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16. Find the probability of getting the number 7, when a usual dice is rolled.



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17. 10 coins are tossed simultaneously. Find the probability of getting atleast 2 tails.



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18. The probability that Mr Anand will get a job in Govt. service is .52, the probability of getting a job in private service is .43 and in both 0.24. Find the probability that

(i) he will get atleast one of these two jobs.

(ii) he will get only one of the two jobs.



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19. Given that $P(A) = .43$, $P(B) = .34$

$P(A \cap B) = .15$. Find (i) $P(A \cap \bar{B})$ (ii) $P(A \cup B)$

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

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20. A dice is rolled .If it shows an even number then find the probability of getting 2.

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21. If $P(A) = 0.65$, $P(B) = 0.51$, $P(A \cap B) = 0.2$

Find (i) $P\left(\frac{A}{B}\right)$ (ii) $P\left(\frac{\bar{A}}{B}\right)$ (iii) $P\left(\frac{A}{\bar{B}}\right)$.

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22. Two persons are selected from a group of 10 (5 boys and 5 girls) in succession. Find the probability that both are boys when

(i) The first person selected is replaced

(ii) Not replaced



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23. If A and B are two independent events each that $P(B) = 0.3$ and $P(A \cup B) = 0.9$. Find $P(A)$.



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24. A coin is tossed twice. Events E and F are defined as follows

E = Head on the first toss

F = Head on the second toss

Find (i) $P(E \cap F)$ (ii) $P\left(\frac{\bar{E}}{F}\right)$

(iii) Are the events E and F independent?

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25. The probability of hitting a target by three persons A, B, C are given by $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$ respectively. If all of them try to hit simultaneously, find the probability that,

(i) None of them hit the target.

(ii) At least one of them will hit the target .

(iii) Exactly one of them will hit the target

(iv) Exactly two of them will hit the target

(v) At least two of them will hit the target.

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26. A speaks truth in 80% cases and B speaks truth in 70% cases. What is the probability that they like to contradict each other in stating the same fact.



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27. The chance of getting admission in IIT is 60% and the chance of getting into Anna University is 70%. Find the probability that a student may get admission in only one of these ?



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28. BOX A contains 6 white balls and 4 red balls. BOX B contains 5 white balls and 5 red balls. One of the boxes is chosen at random and two balls are drawn from it . Find the probability that both balls are red balls .



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29. In a firm two mechanics X and Y produce 65% and 35% of the items produced. It is found that 3% of the items produced by X and 2X of the items produced by Y are defective. If an item is chosen at random, find the probability that it is defective.



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30. A factory has two machines X and Y .X produces 70% and Y produces 30% of the items of which items produced by X have 5% defective items and items produced by Y have 8% defective. An item is drawn at random for the product and is found to be defective. Find the probability that it was produced by Machine Y.



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31. The chances of A,B,C becoming minister of a state are 4:5:6. The probability that the employment opportunities are improved if A,B and C become ministers are 0.4,0.3 and 0.2 respectively. If the employment opportunities are improved .What is the probability that B has become the minister.

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32. Mohan does 50% of the jobs, Vivek does 30% of the jobs and Anand does 20% of the jobs in a company. The probability of an error when Mohan works is 0.03, the probability of an error when Vivek works is 0.04 and that of Anand is 0.05. Suppose an error has occurred in the work who would have done the work.

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33. Three companies A,B,C get contracts from the Govt in the ratio 5:3:2. The probability that these companies finish the works in time, is 60%,80% and 70% respectively. A work given as a contract is finished in time. Find the probability that it is done by company B.



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Solution To 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. What is the chance that (i) non-leap year (ii) leap year should have fifty three 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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Solution To 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) $P(\bar{A} \cap B)$



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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) $P(\overline{B})$ (iii) $P(\text{only } A)$

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3. A dice is thrown twice. Let A and be the event ,First dice shows 5 and B be the event, second dice shown 3 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) $P(A \cap \overline{B})$ (iii) $P(\overline{A} \cap B)$.

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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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Solution To 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 $P(A \cup B) = 0.07$, $P(A \cap B) = 0.02$, and $P(B) = 0.05$, then show that A and B are independent.

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3. If A and B are two independent events such that $P(A \cup B) = 0.06$, $P(A) = 0.02$, find $P(B)$.

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4. If $P(A) = 0.05$, $P(B) = 0.08$ and $P(B/A) = 0.08$, 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 it needs a new oil filter is 0.40, and 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 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,

$$(iii) P(A/B) = 0.4,$$

$$(iv) P(A/B) = 0.5.$$

$$P(A) = 0.4, P(A \cup B) = 0.7, P(B) = ?$$



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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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Solution To 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 boxes 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 firms 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 days total production,

(i)find the probability that the selected pipe is a 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,C becoming manager of a certain company are 5:3:2. The probability 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(ii)if the husband is watching the television, the wife is also watching the television.



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Solution To 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. $\left(\frac{10}{23}\right)$

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

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

Answer: 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: 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



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

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

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

C. $P(A) + P(B) - 2P(A \cap B)$

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

Answer: B

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5. Let A and B are 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. (a) Equally likely but not independent.
- B. (b) Independent but not equally likely
- C. (c) Independent and equally likely
- D. (d) Mutually inclusive and dependent.

Answer: B

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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



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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. 1:2

B. 12:1

C. 13:1

D. 1:13

Answer: A

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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

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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



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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: C



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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



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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: 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: B



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15. A number x is chosen at random from the first 100 natural numbers. Let A be the event of numbers which satisfies

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

A. 0.20

B. 0.51

C. 0.71

D. 0.70

Answer: 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



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17. If two events A and B are such that $P(\bar{A}) = \frac{3}{10}$ and $P(A \cap \bar{B}) = \frac{1}{2}$, then $P(A \cap B)$ is

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

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

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

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

Answer: D



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18. If A and B are two events such that $P(A) = 0.4$, $P(B) = 0.8$ and $P(B/A) = 0.6$, then $P(\bar{A} \cap B)$ 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 : 23

Answer: B



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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: 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: B



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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: B



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

is

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

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

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

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

Answer: 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: 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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Problems For Practice Answer The Following Questions

1. When a pair of balanced dice are rolled .What are the probability of getting the sum.

(i)7(ii)7 or 11(iii)11 or 12

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2. A cricket club has 15 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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3. Four coins are tossed once, find the probability of getting (i) exactly two heads (ii) at least 2 heads (iii) at most 2 heads.

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4. A bag contains 5 white and 7 black balls, 3 balls are drawn at random. Find the probability that (i) all are white, (ii) one white and two black.

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5. In a box containing 10 bulbs, 2 are defective. What is the probability that among 5 bulbs chosen at random, none is defective?

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6. $P(A) = 0.35, P(B) = 0.73, P(A \cap B) = 0.14$, find $P(\bar{A} \cap B), P(A \cup B), P(\bar{A} \cup \bar{B})$.

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7. A card is drawn at random from a well shuffled pack of 52 cards.

Find the probability of drawing.

(a) a king or a spade, (b) a king or a queen.

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8. The probability of a boy getting admission in IIT is 0.16 and probability of getting admission in medical is 0.24. Find the probability that he will get admission in both 0.11 . Find the probability that he will get only one of the two seats.

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9. $P(A) = 0.5, P(B) = 0.6, P(A \cap B) = 0.24$. show that
 $P(\bar{A} \cap B) + P(A \cap \bar{B}) = 0.62$

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

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11. The probability that student will get an reward for sports is 0.38 and another award for studies is 0.42 and the probability of getting both award is 0.2. Find the probability that (i)he will get atleast one award,(ii)he will get only one of the reward.

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12. If $P(A) = 0.4, P(B) = 0.5, P(A \cap B) = 0.25$, find $P(\bar{A} / B) + P(\bar{B} / A)$.

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13. Two cards are drawn from a pack of 52 cards is succession. Find the probability that both the cards are queens,when the first drawn card is not replaced.

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14. A speaks truth in 95% cases and B speaks truth in 90% cases. In what percentage of cases they like to contradict each other in stating the same fact.

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15. A husband and wife appear in an interview for two vacancies in the same office. The probability of husband's selection is $\frac{1}{4}$ and that wife's selection is $\frac{1}{5}$. Find the probability that (i) both are selected, (ii) only one of them will be selected, (iii) none of them will be selected.

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16. A problem in Mathematics is given to three students whose chance of solving it are in the ratio 6:4:3 respectively. What is the probability that (i) the problem is solved (ii) what is the probability that none of them could solve the problem.



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17. The probability of A, B, C hitting a target are $\frac{4}{5}$, $\frac{3}{4}$, $\frac{2}{3}$ respectively. Find the probability that (i) the target is damaged by exactly one hit (ii) the target is damaged by exactly two hits.



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18. An urn contains 8 white and 5 black balls while another urn contains 5 white and 6 black balls. One urn is chosen at random

and two balls are drawn from it. Find the probability that the balls are white.



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19. Goods are sold in 3 retail outlets, X, Y, Z in the ratio 2:3:5. If 90% of the item from X, 80% of item from Y and 95% of item from Z are in good condition (i) what is the probability that an item chosen at random is in good condition. (ii) If a selected item is not in good condition what is the probability that it is from outlet Y?



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20. Three urns containing red and white chips are as follows

Urn I: 6 red and 4 white

Urn II: 3 red and 5 white

Urn III: 4 red and 6 white

An urn is chosen at random and chip is drawn from it. Find the probability that it is white. Find also the probability that it comes from urn II.



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Problems For Practice Choose The Correct Option For The Following

1. Two items are chosen a lot containing 10 items of which 3 are defective, then the probability that at least one of them is defective:

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

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

C. $\frac{7}{10}$

D. $\frac{3}{10}$

Answer: B



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2. If A and B are two events such that

$$P\left(\frac{A}{B}\right) = \frac{1}{3}, P\left(\frac{B}{A}\right) = \frac{1}{2} \text{ and } P(A \cap B) = \frac{1}{7} \text{ then } P(A \cup B)$$

is:

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

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

C. $\frac{4}{7}$

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

Answer: A



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3. If A and B are two events such that $P(\bar{A}) = \frac{3}{4}$, $P\left(\frac{A}{B}\right) = \frac{1}{2}$ and $P\left(\frac{B}{A}\right) = \frac{2}{3}$ then $P(B)$ is:

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

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

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

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

Answer: A



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4. The probability two events A and B are 0.2 and 0.5 respectively.

The probability that both A and B occur simultaneously is 0.15

then the probability that neither A and B occurs is:

A. 0.35

B. 0.45

C. 1

D. 0.55

Answer: B



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5. There are three events A, B and C of which one and only one can happen. If the odds are 5 to 4 against A and 2 to 1 against B, then odds against C is:

A. 2:5

B. 5:2

C. 2:7

D. 7:2

Answer: D



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

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

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

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

Answer: C



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7. 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. The probability that the second ball drawn is red will be:

A. $\frac{3}{12}$

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

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

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

Answer: D



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8. A number is selected from the set $\{2,3,\dots,30\}$. The probability that the selected number is a prime number is

A. $\frac{1}{29}$

B. $\frac{11}{29}$

C. $\frac{10}{29}$

D. $\frac{19}{29}$

Answer: C



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9. Six coins are tossed simultaneously. Then the probability of getting at least 4 heads is:

A. $\frac{11}{32}$

B. $\frac{11}{64}$

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

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

Answer: A



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10. If for two events A and B, $p(a) = \frac{2}{5}$ and $P(b) = \frac{3}{4}$ and $A \cup B = S$ (sample space) then $P\left(\frac{B}{A}\right)$ is:

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

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

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

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

Answer: D



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11. Find the incorrect statement:

A. $P(\bar{A} \cap B) = P(b) - P(A \cap B)$

B. $P(\bar{A} \cap \bar{B}) = P(\overline{A \cup B})$

C. $P(\bar{A} \cup \bar{B}) = P(\overline{A \cup B})$

D. $P(A \cup B) + P(a) + P(b) + P(A \cap B)$

Answer: D

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12. Find the incorrect statement:

A. $P\left(\frac{A}{B}\right) + P\left(\frac{\bar{A}}{B}\right) = 1$

B. $P\left(\frac{A}{B}\right) + \frac{P(A) - P(A \cap B)}{1 - P(B)}$

C. $(\bar{A} \cap \bar{B}) = P(\bar{A}) \cdot (\bar{B})$ if A and B are independent.

$$D. P(A \cup B) = P(a) - P(A \cap B)$$

Answer: D

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13. The following are the probability of two mutually exclusive events A and B such that $A \cup B = S$. Where probabilities are given as a pair. Find the odd man out.

A. $\left(\frac{1}{3}, \frac{2}{3}\right)$

B. $\left(\frac{2}{5}, \frac{3}{5}\right)$

C. $\left(\frac{3}{7}, \frac{2}{7}\right)$

D. $\left(\frac{4}{9}, \frac{5}{9}\right)$

Answer: C

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14. The following are the probability of an event A. Find odd man out

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

B. $\frac{5}{9}$

C. $\frac{21}{24}$

D. $\frac{41}{30}$

Answer: D



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15. Find the correct statement:

A. $P(\phi) = 1$

B. $P(S)=0$, S is the sample space

C. If A and B are independent

$$P(\bar{A} \cap B) = P(\bar{A}) \cdot P(b)$$

D. If A and B are independent events then

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

Answer: D



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16. The following are the probability of an event A . Find odd man out

A. $\frac{6}{7}$

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

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

D. $\frac{2}{21}$

Answer: B

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17. Find the incorrect statement:

A. If $P(a) \neq 0$, $P(b) \neq 0$ and if A and B are mutually exclusive they cannot be independent.

B. If A and B are independent they cannot be mutually exclusive

C. If A and B are any two events then probability that exactly one of them occurs is $P(A \cap \bar{B}) + P(\bar{A} \cap B)$

D. For any two events A and B

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

Answer: C



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18. In a factory two machines A and B produce equal amount of output. On the average 10% item produced by A and 5% item produced by B are defective. Find the probability that an item drawn from a days output is defective:

A. $\frac{3}{40}$

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

C. $\frac{3}{10}$

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

Answer: A



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19. Let A and B are 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. not independent
- B. Independent but not equally likely
- C. Equally likely but not independent
- D. Mutually exclusive

Answer: B



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20. When a pair of balanced dice are rolled .What are the probability of getting the sum.

(i)7(ii)7 or 11(iii)11 or 12

A. $\frac{1}{24}$

B. $\frac{1}{12}$

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

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

Answer: B



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21. A,B,C,D are mutually exclusive and exhaustive events if

$P(A) = \frac{1}{2}$, $P(B) = \frac{1}{4}$, $P(C) = \frac{1}{8}$. What is $P(D)$?

A. $\frac{1}{64}$

B. $\frac{1}{32}$

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

D. $\frac{1}{12}$

Answer: C

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22. An urn contains 3 white, 4 red and 5 black balls. Two balls are drawn one by the one without replacement. What is the probability that at least one ball is black?

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23. 4 mangoes and 3 apples are in a box. If two fruits are drawn at random the probability that both are of the same variety is:

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

B. $\frac{4}{7}$

C. $\frac{6}{7}$

D. none of these

Answer: A

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24. Out of 10 outstanding students in a school there are 6 girls and 4 boys. A team of 4 students is selected at random for a quiz programme, find the probability that there are at least 2 girls.

A. $\frac{35}{42}$

B. $\frac{37}{42}$

C. $\frac{41}{42}$

D. $\frac{17}{42}$

Answer: B

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25. Given that $P(A) = 0.35$, $P(B) = 0.73$ and $P(A \cap B) = 0.14$,

find $P(\overline{A} \cup \overline{B}) - P(\overline{A} \cap \overline{B})$:

A. 0.94

B. 0.59

C. 0.80

D. 6.86

Answer: C



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26. A card is drawn at random from a well shuffled pack of 52 cards. Find the probability that it is a king or black card.

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

B. $\frac{15}{26}$

C. $\frac{3}{13}$

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

Answer: D



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27. The probability that a student will get a pass mark in mathematics is 0.17 and that of getting pass mark in English is 0.25. The probability that he will get pass in both subjects is 0.12. What is the probability that he will get pass mark only one of the two subjects:

A. 0.18

B. 0.19

C. 0.17

D. 0.16

Answer: A

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28. The probability of an event A occur is 0.6 and B occurring is 0.3.

If A and B are mutually exclusive events than the probability of neithetr A nor B occurring is :

A. 0.9

B. 0.1

C. 0.3

D. 0.6

Answer: B



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29. If $P(A) = 0.4$, $P(B) = 0.5$, $P(A \cap B) = 0.25$, find $P(A/\bar{B})$

is:

A. 0.25

B. 0.1

C. 0.3

D. 0.5

Answer: C



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30. A coin is tossed twice .Events E and F are defined as follows

E=Head on the first toss

F=Head on the second toss

Find (i) $P(E \cap F)$ (ii) $P\left(\frac{\bar{E}}{F}\right)$

(iii) Are the events E and F independent?

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

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

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

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

Answer: D



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31. A problem is given to three students A,B,C then probability of solving is 0.6,0.5 and 0.7 respectively. What is the probability that is solved:

A. 0.94

B. 0.35

C. 0.06

D. 0.42

Answer: A



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32. If two events A and B , $P(A) = \frac{2}{5}$, $P(B) = \frac{3}{4}$ and $A \cup B$ is the simple space. Then $P(A/B)$ is:

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

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

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

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

Answer: B



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33. $P(A \cup B) = 0.6$, $P(A) = 0.2$, find $P(B)$ given that A and B are independent:

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

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

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

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

Answer: C



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34. If $P(A) = 0.45$, $P(A \cup B) = 0.75$ and $P(B/A) = 0.5$,

find $P(B)$:

A. 0.325

B. 0.425

C. 0.625

D. 0.525

Answer: D



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35. A letter is taken at random from the letters of the word "GANGA" and another letter is taken at random from the letters of the word "BANGA". The probability that the selected letters are the same is:

A. $\frac{7}{25}$

B. $\frac{17}{25}$

C. $\frac{5}{25}$

D. $\frac{9}{25}$

Answer: A



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36. A number x is chosen at random from the first 100 natural numbers. Let A be the event of numbers which satisfies $\frac{(x - 15)(x - 55)}{x - 20}$, then $P(A)$ is:

A. 0.41

B. 0.51

C. 0.61

D. 0.69

Answer: B



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37. If a and b are chosen randomly from the set $\{2,3,4,5\}$ with replacement, then the probability of the real roots of the equation

$x^2 + ax + b = 0$ is:

A. $\frac{11}{26}$

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

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

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

Answer: C



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38. Ten coins are tossed. The probability of getting at least 4 heads is:

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39. (i) $P(A \cap B) = P(A) \cdot P(B)$ if A and B are independent

(ii) From numbers 1 to 100 probability of selecting a number which is divisible by 5 is $\frac{2}{5}$.

(iii) When two dice are tossed the probability of getting the sum as 13 is zero.

(iv) $P\left(\frac{A}{B}\right) = \frac{P(A \cup B)}{P(B)}$

state which pair of the statement stated above is correct.

A. (i) and (ii) are true

B. (i) and (iii) are true

C. (ii) and (iii) are true

D. (ii) and (iv) are true

Answer: B



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