MATHS

BOOKS - OMEGA PUBLICATION

PROBABILITY

Questions

1. Compute $P(A \mid B)$,if $P(B) = 0.5$ and $P(A \cap B) = 0.32$

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2. A fair die is rolled . Consider events

$E = \{1, 3, 5\}, F = \{2, 3\}$ and

$G = \{2, 3, 4, 5\}$. Find

(i) $P(E/F)$ and $P(F/E)$

(ii) $P(E/G)$ and $P(G/E)$

(iii) $P(E \cup F/G)$ and $P(E \cap F/G)$

3. A fair dic is rolled. Consider events E= {1, 3,5}, F{2,3} and G= {2,3,4,5}. Find P(E/G) and P(G/E)

4. Assume that each born child is equally likely to be a boy or a girl. If a family has two children, what is the conditional probability that both are girls given that the youngest is a girl.

5. Assume that each child born is equally likely to be a boy or a girl. If a family has two children, what is the conditional probability that both are girls? Given that (i) the youngest is a girl, (ii) at least one is a girl.

6. Given that the two numbers appearing on throwing two dice are different. Find the

probability of the event 'the sum of numbers on the dice is 4'.

7. 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.

8. A die marked 1, 2, 3 in red and 4, 5, 6 in green is tossed. Let A be the event, 'the number is even,' and B be the event, 'the number is red'. Are A and B independent?

9. Given that the events A and B are such that $P(A) = \dfrac{1}{2}$, $P(A \cup B) = \dfrac{3}{5}$ and $P(B) = p$. find p if they are

mutually exclusive.

10. Given that the events A and B are such that

$$P(A) = \frac{1}{2}, \ P(A \cup B) = \frac{3}{5} \ \text{ and } \ P(B) = p$$

.Find p if they are independent.

11. Probability of solving specific problem independently by A and B are $\frac{1}{2}$ and $\frac{1}{3}$ respectively. If both try to solve the problem

independently, find the probability that the problem is solved.

12. If A and B are two events such that $P(A) = \dfrac{1}{4}, P(B) = \dfrac{1}{2}$ and $P(A \cap B) = \dfrac{1}{8}$, find P (not A and not B) .

13. If $P(A) = \dfrac{1}{2}$, $P(B) = \dfrac{7}{12} p$ (not A or not B)= $\dfrac{1}{4}$

State whether A and B are independent .

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14. Two balls are drawn at random with replacement from a box containing 10 black and 8 red balls. Find the probability that both balls are red.

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15. Two balls are drawn at random with replacement from a box containing 10 black and 8 red balls. Find the probability that first ball is black and second is red.

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16. Two balls are drawn at random with replacement from a box containing 10 black and 8 red balls. Find the probability that one of them is black and other is red.

17. An unbiased die is thrown twice. Let the event A be 'odd number on the first throw' and B the event 'odd number on the second throw'. Check the independence of the events A and B.

18. Let E and F be events with $P(E) = \dfrac{3}{5}$, $P(F) = \dfrac{3}{10}$ and $P(E \cap F) = \dfrac{1}{5}$

. Are E and F independent?

19. A bag contains 4 red and 4 black balls, another bag contains 2 red and 6 black balls. One of the two bags is selected at random and a ball is drawn from the bag which is found to be red. Find the probability that the ball is drawn from the first bag.

20. There see three coins,one is a two headed coin (having head on both the faces),another is a biased coin that comes up heads 75% of the time and the third is anunbiased coin.One of the three coins is choosen at random and tossed.Of it shows head,what is probability that it was the two headed coin?

21. A card from a pack of 52 cards is lost. From the remaining cards of the pack, two cards are

drawn and are found to be both diamonds. Find the probability of the lost card being a diamond.

22. Give three identical boxes I , II and III, each containing two coins. In box I both coins are gold coins, in box II both are silver coins and in box III there is one gold and one silver coin. A person chooses a box at random and takes out a coin. If the coin is of gold, what is the

probability that the other coin in the box is also of gold ?

23. Find the probability distribution of the number of successes in two tosses of a die, where a success is defined as : number greater than 4

24. Find the probability distribution of number of heads in two tosses of a coin

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25. Find the probability distribution of number of tails in the simultaneous tosses of three coins.

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26. Find the Probability distribution of the number of heads when three coins are tossed.

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27. From a lot of 30 bulbs which include 6 defectives, a sample of 4 bulbs is drawn at random with replacement. Find the probability distribution of the number of defective bulbs.

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28. Two cards are drawn successively with replacement from a well-shuffled deck of 52 cards. Find the probability distribution of the number of aces.

29. A coin is biased so that the head is 3 times as likely to occur as tail. If the coin is tossed twice, find the probability distribution of number of tails.

30. The random variable X has a probability distribution P(X) of the following form, where k is some number : $P(x) = \{(k, , \text{if}_{,,}$ $x = 0), (2k, , \text{if}_{,,}x = 1), (3k, , \text{if}_{,,}$ $x = 2), (0, , , ,) :\}$ Determine the value of k.

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31. The random variable X has a probability distribution P(X) of the following form, where

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$x = 2), (0, , , ,) :\}$ find

$P(X < 2), P(X \leq 2), P(X \geq 2)$.

32. A random variable X has the following

probability distribution

X	0	1	2	3	4	5	6	7
P(X)	0	K	2K	2K	3K	K^2	$2K^2$	$7K^2 + K$

Determine :

K

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X	0	1	2	3	4	5	6	7
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Determine :

$P(X < 3)$

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Determine :

$P(X > 6)$

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Determine :

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36. Two numbers are selected at random (without replacement) from the first six positive integers. Let X denotes the larger of two numbers obtained. Find E(X). Where E(X) expectation of X.

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38. A die is thrown 6 times. If getting an odd numebr is a succes, what is the probability of atleast 5 successes?

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39. A die is thrown 6 times. If 'getting an odd number' is a success, what is the probability of 5 successes?

40. Let X denote the sum of the numbers obtained when two fair dice are rolled. Find the variance and standard deviation of X.

41. Here, probability distribution of X is

X	0	1
P(X)	$\dfrac{30}{100}$	$\dfrac{70}{100}$

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42. A pair of dice is thrown 4 times. If getting a doublet is considered a success then find the probability of exactly 2 successes.

43. On a multiple choice examination with three possible answers for each of the five questions, what is the probability that a candidate would get four or more correct answers just by guessing ?

44. Five cards are drawn successively with replacement from a well-shuffled deck of 52

cards. What is the probability that all the five

cards are spades?

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45. Five cards are drawn successively with

replacement from a well-shuffled deck of 52

cards. What is the probability that only 3 cards

are spades?

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46. Five cards are drawn successively with replacement from a well-shuffled deck of 52 cards. What is the probability that none is a spade?

47. A bag consists of 10 balls each marked with one of the digits 0 to 9. If four balls are drawn successively with replacement from the bag,

what is the probability that none is marked with the digit 0?

48. Find the probability of getting 5 exactly twice in 7 throws of a die.

49. Find the probability of throwing at most 2 sixes in 6 throws of a single die.

50. Ten eggs are drawn successively with replacement from a lot containing 10% defective eggs. Find the probability that there is at least one defective egg.

51. Let E and F be events with $P(E) = \dfrac{3}{5}$, $P(F) = \dfrac{3}{10}$ and $P(E \cap F) = \dfrac{1}{5}$

. Are E and F independent?

52. A person buys a lottery ticket in 50 lotteries, in each of which his chance of winning a prize is $\dfrac{1}{100}$. What is the probability that he will win a prize at least once.

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56. Find the mean number of heads in three tosses of a fair coin.

57. Suppose a girl throws a die. If she gets a 5 or 6, she tosses a coin three times and notes the numbers of heads. If she gets 1,2,3, or 4, she tosses a coin once and notes whether a head or a tail is obtained. If she attained exactly one head what is the probability that she threw 1,2,3, or 4 with the die?

58. Two dice are thrown simultaneously. If X denotes the number of sixes, find the expectation of X.

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61. If a fair coin is tossed 10 times, find the probability of: at least six heads

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63. Find the probability distribution of the number of sixex in two tosses of a die .

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76. Events A and B are such that $P(A) = \dfrac{1}{2}, P(B) = \dfrac{7}{12}$ and P(not A or not B) $= \dfrac{1}{4}$. State whether A and B are independent.

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and 8 red balls. Find the probability that both balls are red.

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where a success is defined as : number greater than 4

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93. State true or false for the following statements :

The random variable X has probability distribution P(X) of the following form, where

k is some number:

$$P(X) = \begin{cases} k, & \text{if } x = 0 \\ 2k, & \text{if } x = 1 \\ 3k, & \text{if } x = 2 \\ 0, & \text{otherwise} \end{cases}$$ Then k = 6

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Find $P(X < 2), P(X \leq 2), P(X \geq 2)$

95. A random variable X has the following probability distribution

X	0	1	2	3	4	5	6	7
P(X)	0	K	2K	2K	3K	K^2	$2K^2$	$7K^2 + K$

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X	0	1	2	3	4	5	6	7
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X	0	1	2	3	4	5	6	7
P(X)	0	K	2K	2K	3K	K^2	$2K^2$	$7K^2 + K$

Determine :

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Determine :

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99. Two numbers are selected at random (without replacement) from the first six positive integers. Let X denotes the larger of two numbers obtained. Find E(X). Where E(X) expectation of X.

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102. A die is thrown 6 times. If getting an 'odd number' is success, find the probability at most 5 successes.

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103. Let X denote the sum of the numbers obtained when two fair dice are rolled. Find the variance and standard deviation of X.

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104. Write $(-5, 9]$ in set-builder form.

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105. A pair of dice is thrown 4 times. If getting a doublet is considered a success, find the probability of two successes.

106. On a multiple choice examination with three possible answers for each of the five questions, what is the probability that a candidate would get four or more correct answers just by guessing ?

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115. A person buys a lottery ticket in 50 lotteries, in each of which his chance of winning a prize is $\dfrac{1}{100}$. What is the probability that he will win a prize at least once.

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119. Find the mean number of heads in three tosses of a fair coin.

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126. Find the probability distribution of the number of success in two tosses of dice where success is six appear on atleast one dic.

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1. In a game, a man wins a rupee for a six and loses a rupee for any other number when a fair die is thrown. The man decided to throw a

die thrice but to quit as and when he gets a six. Find the expected value of the amount he wins / loses.

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2. Find the probability distribution of number of doublets in three throws of a pair of dice.

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3. If a leap year is selected at random, what is the chance that it will contain 53 tuesdays?

4. In a hurdle race, a player has to cross 10 hurdles. The probability that he will clear each hurdle is $\dfrac{5}{6}$. What is the probability that he will knock down fewer than 2 hurdles?

5. Suppose that 5% of men and 0.25% of women have grey hair. A grey haired person is selected at random. What is the probability of this person being male? Assume that there are equal number of males and females.

6. A man is known to speak truth 3 out of 4 times. He throws a die and reports that it is a six. Find the probability that it is actually six.

7. A and B throw a pair of die turn by turn. The first to throw a total of 9 is awarded a prize. If A starts the game. Show that the probability of A getting the prize is $\dfrac{9}{17}$

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8. Coloured balls are distributed in three bags as shown in the following table

Bag	Colour of the ball		
	Black	White	Red
I	2	1	3
II	4	2	1
III	5	4	3

A bag is selected at random and then balls are randomly drawn from the selected bag. They happen to the white and red. What is the probability that they came from bag II?

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1. If $P(A) = \dfrac{1}{2}$, $P(B) = 0$ then $P(A \mid B)$ is :

A. 0

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

C. not defined

D. 1

Answer: C

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2. If A and B are two events such that $A \cap B \neq \phi, P\left(\dfrac{A}{B}\right) = P\left(\dfrac{B}{A}\right)$. Then.

    A. $A \subset B$ but $A \neq B$

    B. A=B

    C. $A \cap B = \phi$

    D. $P(A) = P(B)$

Answer: D

3. The probability of obtaining an even prime number on each die, when a pair of dice is rolled is :

A. 0

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

C. $\dfrac{1}{12}$

D. $\dfrac{1}{36}$

Answer: D

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4. Two events A and B will be independent, if:

A. A and B are mutually exclusive

B. P(A'B')= [1-P(A)] [1-P(B)]

C. P(A)= P(B)

D. $P(A) + P(B) = 1$

Answer: B

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5. Probability that A speaks truth is $\frac{4}{5}$. A coin is tossed. A reports that a head appears. The probability that actually there was head is

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

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

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

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

Answer: A

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

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

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

D. none of these

Answer: C

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7. The mean of the numbers obtained on throwing a die having written 1 on three faces, 2 on two faces and 5 on one face is:

A. 1

B. 2

C. 5

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

Answer: B

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8. Suppose that two cards are drawn at random from a deck of cards. Let X be the number of aces obtained. Then the value of E(X) is:

A. $\dfrac{37}{221}$

B. $\dfrac{5}{13}$

C. $\dfrac{1}{13}$

D. $\dfrac{2}{13}$

Answer: D

9. In a box containing 100 bulbs, 10 are defective. The probability that out of a sample of 5 bulbs none is defective is :

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

B. $\left(\dfrac{1}{2}\right)^5$

C. $\left(\dfrac{9}{10}\right)^5$

D. $\dfrac{9}{10}$

Answer: C

10. The probability that a student is not a swimmer is $\frac{1}{5}$. Then the probability that out of five students, four are swimmers is:

A. $^5C_4 \left(\frac{4}{5}\right)^4 \left(\frac{1}{5}\right)$

B. $\left(\frac{4}{5}\right)^4 \left(\frac{1}{5}\right)$

C. $^5C_1 \left(\frac{1}{5}\right) \left(\frac{4}{5}\right)^4$

D. none of these

Answer: A

11. If $P\left(\dfrac{A}{B}\right) > P(A)$, then which of the following is correct : :

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

    B. $P(A \cap B) < P(A) . P(B)$

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

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

Answer: A

12. If A and B are two events such that $P(A) \neq 0$ and $P\left(\dfrac{B}{A}\right) = 1$, then

A. $A \subset B$

B. $B \subset A$

C. $B = \phi$

D. $A = \phi$

Answer: C

13. If A and B are any two events such that :

$P(A) + P(B) - P(A$ and B$)$ = P(A)`, then

A. P(B/A)=1

B. P(A/B)=1

C. P(B/A)=0

D. P(A/B)=0

Answer: B

14. If $P(A) = \dfrac{6}{11}, P(B) = \dfrac{5}{11}$ and $P(A \cup B) = \dfrac{-1}{11}$ then $P(A \cap B)$ is

A. $\dfrac{4}{11}$

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

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

D. none of these

Answer: B

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15. If $P(A) = \dfrac{6}{11}, P(B) = \dfrac{5}{11}$ and $P(A \cup B) = \dfrac{-1}{11}$ then $P(A \cap B)$ is

A. $\dfrac{4}{11}$

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

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

D. none of these

Answer: A

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16. The event A and B are independent if

A. $P(A \cap B) = P(A) + P(B)$

B. $P(A \cap B) = P(A).\,P(B)$

C. $P(A \cap B) = P(A/B).\,P(B)$

D. none of these

Answer: B

17. Three coins are tossed then probability of at least one head

A. $\dfrac{1}{8}$

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

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

D. none of these

Answer: C

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18. If $P(A) = \dfrac{7}{13}, P(B) = \dfrac{9}{13}$ and $P(A \cap B) = \dfrac{4}{13}$· then `P(A/B) is equal to :

A. $\dfrac{9}{4}$

B. $\dfrac{9}{13}$

C. $\dfrac{4}{9}$

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

Answer: C

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19. If $2P(A) = P(B) = \dfrac{5}{13}$ and $P(A/B) = \dfrac{2}{5}$ then find $P(A \cup B)$.

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

B. $\dfrac{26}{11}$

C. $\dfrac{5}{13}$

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

Answer: A

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20. If $P(A) = \dfrac{1}{2}$, $P(B) = 0$ then $P(A \mid B)$ is

:

A. 0

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

C. not defined

D. 1

Answer: C

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21. If A and B are two events such that $A \cap B \neq \phi, P\left(\dfrac{A}{B}\right) = P\left(\dfrac{B}{A}\right)$. Then.

A. $A \subset B$but $A \neq B$

B. A=B

C. $A \cap B = \phi$

D. $P(A) = P(B)$

Answer: D

22. The probability of obtaining an even prime number on each die, when a pair of dice is rolled is :

    A. 0

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

    C. $\dfrac{1}{12}$

    D. $\dfrac{1}{36}$

Answer: D

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23. Two events A and B will be independent, if:

A. A and B are mutually exclusive

B. P(A'B')= [1-P(A)] [1-P(B)]

C. P(A)= P(B)

D. $P(A) + P(B) = 1$

Answer: B

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24. Probability that A speaks truth is $\dfrac{4}{5}$. A coin is tossed. A reports that a head appears. The probability that actually there was head is

A. $\dfrac{4}{5}$

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

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

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

Answer: A

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

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

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

D. none of these

Answer: C

26. The mean of the numbers obtained on throwing a die having written 1 on three faces, 2 on two faces and 5 on one face is:

A. 1

B. 2

C. 5

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

Answer: B

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27. Suppose that two cards are drawn at random from a deck of cards. Let X be the number of aces obtained. Then the value of E(X) is:

A. $\dfrac{37}{221}$

B. $\dfrac{5}{13}$

C. $\dfrac{1}{13}$

D. $\dfrac{2}{13}$

Answer: D

28. In a box containing 100 bulbs, 10 are defective. The probability that out of a sample of 5 bulbs none is defective is :

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

B. $\left(\dfrac{1}{2}\right)^5$

C. $\left(\dfrac{9}{10}\right)^5$

D. $\dfrac{9}{10}$

Answer: C

29. The probability that a student is not a swimmer is $\frac{1}{5}$. Then the probability that out of five students, four are swimmers is

A. $^5C_4\left(\frac{4}{5}\right)^4\left(\frac{1}{5}\right)$

B. $\left(\frac{4}{5}\right)^4\left(\frac{1}{5}\right)$

C. $^5C_1\left(\frac{1}{5}\right)\left(\frac{4}{5}\right)^4$

D. none of these

Answer: A

30. If $P\left(\dfrac{A}{B}\right) > P(A)$, then which of the following is correct : :

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

B. $P(A \cap B) < P(A).P(B)$

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

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

Answer: A

31. If A and B are two events such that

$P(A) \neq 0$ and $P\left(\dfrac{B}{A}\right) = 1$, then

A. $A \subset B$

B. $B \subset A$

C. $B = \phi$

D. $A = \phi$

Answer: C

32. If A and B are any two events such that :

$P(A) + P(B) - P(A \text{ and } B) = $ P(A)`, then

A. P(B/A)=1

B. P(A/B)=1

C. P(B/A)=0

D. P(A/B)=0

Answer: B

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33. If $P(A) = \dfrac{6}{11}, P(B) = \dfrac{5}{11}$ and $P(A \cup B) = \dfrac{7}{11}$ find: $P(A \mid B)$

A. $\dfrac{4}{11}$

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

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

D. none of these

Answer: B

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34. If $P(A) = \dfrac{6}{11}, P(B) = \dfrac{5}{11}$ and $P(A \cup B) = \dfrac{7}{11}$ find: $P(A \mid B)$

A. $\dfrac{4}{11}$

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

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

D. none of these

Answer: A

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35. The event A and B are independent if

A. $P(A \cap B) = P(A) + P(B)$

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

C. $P(A \cap B) = P(A/B).P(B)$

D. none of these

Answer: B

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36. Three coins are tossed then probability of at least one head

A. $\dfrac{1}{8}$

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

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

D. none of these

Answer: C

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37.

$$P(A) = \frac{7}{13}, P(B) = \frac{9}{13} \text{ and } P(A \cap B) = \frac{4}{13}$$

then $P(A \mid B)$

A. $\dfrac{9}{4}$

B. $\dfrac{9}{13}$

C. $\dfrac{4}{9}$

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

Answer: C

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38. If $2P(A) = P(B) = \dfrac{5}{13}$ and $P(A/B) = \dfrac{2}{5}$ then find $P(A \cup B)$.

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

B. $\dfrac{26}{11}$

C. $\dfrac{5}{13}$

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

Answer: A

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