

VELAMMAL VIDYALAYA WEEK LONG BOARDING SCHOOL
VALUE BASED QUESTIONS & SOLUTIONS
PROBABILITY

1. Probability of winning when batting coach A and bowling coach B working independently are $\frac{1}{2}$ and $\frac{1}{3}$ respectively. If both try for the win independently find the probability that there is a win. Will the independently working may be effective? And why?

$$\text{Given: } P(A) = \frac{1}{2}; P(\bar{A}) = \frac{1}{2}; P(B) = \frac{1}{3}; P(\bar{B}) = \frac{2}{3}$$

$$P(\text{Winning}) = P(A \text{ work \& B did not work}) + P(A \text{ did not work \& B work}) + P(\text{Both work})$$

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

$$= \left(\frac{1}{2} \times \frac{2}{3}\right) + \left(\frac{1}{2} \times \frac{1}{3}\right) + \left(\frac{1}{2} \times \frac{1}{3}\right) = \frac{2}{6} + \frac{1}{6} + \frac{1}{6} = \frac{4}{6} = \frac{2}{3}$$

Ans.2/3

Value 1. Chances of success increase when ideas flow independently.

2. Hard work pays the fruits

2. A person has undertaken a construction job. The probabilities are 0.65 that there will be strike, 0.80 that the construction job will be completed on time if there is no strike and 0.32 that the construction job will be completed on time if there is strike. Determine the probability that the construction job will be completed on time. What values are driven by this question?

$$P(E_1) = P(\text{There will be a strike}) = 0.65; P(A/E_1) = 0.32$$

$$P(E_2) = P(\text{There will be no strike}) = 0.35; P(A/E_2) = 0.80$$

Where A = The construction job will be completed in time.

$$P(A) = P(E_1) \times P(A/E_1) + P(E_2) \times P(A/E_2)$$

$$= 0.65 \times 0.32 + 0.35 \times 0.80 = 0.208 + 0.28 = 0.488$$

Ans.0.488

Value: Peace is better than strike. As the probability of completion of job on time if there is strike is less than $\frac{1}{2}$.

3. A clever student used a biased coin so that the head is 3 times as likely to occur as tail. If the coin tossed twice find the probability distribution and mean of numbers of tails. Is this a good tendency? Justify your answer.

$$P(H) = 3/4; P(T) = 1/4; \text{Event: Tails; } n=2; X=0, 1, 2$$

$$P(0) = \frac{3}{4} \times \frac{3}{4} = \frac{9}{16}; P(1) = \frac{3}{4} \times \frac{1}{4} \times 2 = \frac{6}{16}; P(2) = \frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$$

Probability distribution is

x	0	1	2
p(x)	$\frac{9}{16}$	$\frac{6}{16}$	$\frac{1}{16}$

$$\text{Mean} = \sum XP = 0 \times \frac{9}{16} + 1 \times \frac{6}{16} + 2 \times \frac{1}{16} = 0 + \frac{6}{16} + \frac{2}{16} = \frac{8}{16} = \frac{1}{2}$$

Ans. Mean = $\frac{1}{2}$

Value: 1. No, it may be good once or twice but not forever.

2. Honesty pays in a long run.

4. A man is known to speak truth 5 out of 6 times. He draws a ball from the bag containing 4 white and 6 black balls and reports that it is white. Find the probability that it is actually white? Do you think that speaking truth is always good?

$$P(E_1) = P(\text{speaking truth}) = \frac{5}{6}; P(A/E_1) = \frac{4}{10}$$

$$P(E_2) = P(\text{not speaking truth}) = \frac{1}{6}; P(A/E_2) = \frac{6}{10}$$

Where A = Telling as White.

$$P(E_1/A) = \frac{P(E_1) \times P(A/E_1)}{P(E_1) \times P(A/E_1) + P(E_2) \times P(A/E_2)}$$

$$= \frac{\frac{5}{6} \times \frac{4}{10}}{\frac{5}{6} \times \frac{4}{10} + \frac{1}{6} \times \frac{6}{10}} = \frac{20}{26} = \frac{10}{13}$$

Ans.10/13 Value: Speaking truth pays in the long run. Sometimes lie told for a good cause is not bad.

5. If group A contains the students who try to solve the problem by knowledge, Group B contains the students who guess to solve the problem Group C contains the students who give answer by cheating. If n(A) = 20, n(B) = 15, n(C) = 10, 2 Students are selected at random. Find the probability that they are from group c. Do you think that cheating habit spoils the career?

$$n(A) = 20, n(B) = 15, n(C) = 10, n(S) = 45$$

$$P(2 \text{ students from Group C}) = \frac{{}^{10}C_2}{{}^{45}C_2} = \frac{10 \times 9}{45 \times 44} = \frac{1}{22}$$

Ans.1/22 Value: Yes, because a cheater finds it to do any work independently. But it is harmful in long run

6. A drunkard man takes a step forward with probability 0.4 and takes a step backward with probability 0.6. He takes 11 steps in all. Find the probability that he is just one step away from the initial point. Do you think drinking habit can ruin one's family life?

The man will be one step away from the starting point if

(i) either he is one step ahead (i.e $6F+5B = 11$ step) 6 step forward and five step backward.

(ii) One step behind the starting point (i.e., $6B + 5F = 11$ steps) 6 step Backward and 5 steps forward.

$$\begin{aligned} P(\text{Case i}) \text{ (or) } P(\text{Case ii}) &= \\ &= {}^{11}C_6 x (0.4)^6 x (0.6)^5 + {}^{11}C_6 x (0.6)^6 x (0.4)^5 \\ &= {}^{11}C_6 [(0.4)^6 x (0.6)^5 + (0.6)^6 x (0.4)^5] \\ &= 462 ((0.4)^5 x (0.6)^5) [0.4 + 0.6] \\ &= 462 ((0.4)^5 x (0.6)^5) \\ &= 462 (0.24)^5 \end{aligned}$$

Ans. $462(0.24)^5$

Value: Yes, addiction of wine or smoking is definitely harmful for a person and its family

7. In a school, 30% of the student has 100% attendance. Previous year result report tells that 70% of all students having 100% attendance attain A grade and 10% of remaining students attain A grade in their annual examination. At the end of the year, One student is chosen at random and he has an A grade. What is the probability that the student has 100% attendance? Also state the factors which affect the result of a student in the examination.

$$P(E_1) = P(\text{students having 100\% attendance}) = \frac{30}{100} = \frac{3}{10}; P(A/E_1) = \frac{7}{10}$$

$$P(E_2) = P(\text{students not having 100\% attendance}) = \frac{70}{100} = \frac{7}{10}; P(A/E_2) = \frac{1}{10}$$

Where A = getting A grade.

$$P(E_1/A) = \frac{P(E_1) \times P(A/E_1)}{P(E_1) \times P(A/E_1) + P(E_2) \times P(A/E_2)}$$

$$\begin{aligned} &= \frac{\frac{3}{10} \times \frac{7}{10}}{\frac{3}{10} \times \frac{7}{10} + \frac{7}{10} \times \frac{1}{10}} = \frac{21}{28} = \frac{3}{4} \end{aligned}$$

Ans. $\frac{3}{4}$ Value Factors :- (i) Regular study (ii) Hard work (iii) Good memory (iv) Well time management (v) Writing skills

8. A man is known to speak truth 3 out of 4 times. He throws a die and reports that it is six. Find the probability that it is actually a six. Write any three benefits of speaking the truth.

$$P(E_1) = P(\text{the man speak truth}) = \frac{3}{4}; P(A/E_1) = \frac{1}{6}$$

$$P(E_2) = P(\text{the man tell lie}) = \frac{1}{4}; P(A/E_2) = \frac{5}{6}$$

Where A = Actually six.

$$\begin{aligned} P(E_1/A) &= \frac{P(E_1) \times P(A/E_1)}{P(E_1) \times P(A/E_1) + P(E_2) \times P(A/E_2)} \\ &= \frac{\frac{3}{4} \times \frac{1}{6}}{\frac{3}{4} \times \frac{1}{6} + \frac{1}{4} \times \frac{5}{6}} = \frac{3}{3+5} = \frac{3}{8} \end{aligned}$$

Ans. $\frac{3}{8}$ Value: (i) It gives positive thinking & satisfaction (ii) Everyone loves it. (iii) It is good life skill

9. There are 20 People in a group. Out of them 7 people are non-vegetarian, 2 people are selected randomly. Write the probability distribution of non-vegetarian people. Explain whether you would like to be vegetarian or non-vegetarian and why? Also keeping life of animals in mind how would you promote a person to be vegetarian?

$$P(\text{Vegetarian}) = \frac{13}{20}, P(\text{Non-Vegetarian}) = \frac{7}{20}$$

Event = Non Vegetarian; $X = 0, 1, 2$

$$P(0) = \frac{13}{20} \times \frac{12}{19} \times ({}^2C_0) = \frac{156}{380}$$

$$P(1) = \frac{13}{20} \times \frac{7}{19} \times ({}^2C_1) = \frac{192}{380}$$

$$P(2) = \frac{7}{20} \times \frac{6}{19} \times \binom{2}{2} = \frac{42}{380} \text{ Ans:}$$

x	0	1	2
p(x)	$\frac{156}{380}$	$\frac{192}{380}$	$\frac{42}{380}$

Value: I would like to be a vegetarian because vegetarian food is much easier to digest than non vegetarian (may be given other reason) Or For non- vegetarian food we have to kill animals this is not good thing because everybody has right to survive, etc

10. Two third of the students in a class are sincere about their study and rest are careless Probability of passing in examination are 0.7 and 0.2 for sincere and careless students respectively, A Student is chosen and is found to be passed what is the probability that he/she was sincere. Explain the importance of sincerity for a student.

$$P(E_1) = P(\text{sincere}) = \frac{2}{3}; P(A/E_1) = \frac{7}{10}$$

$$P(E_2) = P(\text{careless}) = \frac{1}{3}; P(A/E_2) = \frac{2}{10}$$

Where A = Passing .

$$P(E_1/A) = \frac{P(E_1) \times P(A/E_1)}{P(E_1) \times P(A/E_1) + P(E_2) \times P(A/E_2)}$$

$$= \frac{\frac{2}{3} \times \frac{7}{10}}{\frac{2}{3} \times \frac{7}{10} + \frac{1}{3} \times \frac{2}{10}} = \frac{14}{16} = \frac{7}{8}$$

Ans. 7/8

Value: A Student is future of a country. If a student is sincere then he/she can serve the country in a better way.

11. A company has two plants of scooter manufacturing. Plant I manufacture 70% Scooter and plant II manufactures 30%. At plant I 80% of the scooter's are maintaining pollution norms and in plant II 90% of the scooter maintaining Pollution norms. A Scooter is chosen at random and is found to be fit on pollution norms. What is the probability that it has come from plant II. What is importance of pollution norms for a vehicle?

$$P(E_1) = P(\text{Scooter manufactured in plant I}) = \frac{7}{10}; P(A/E_1) = \frac{8}{10}$$

$$P(E_2) = P(\text{Scooter manufactured in plant II}) = \frac{3}{10}; P(A/E_2) = \frac{9}{10}$$

Where A = scooter fit on pollution norms..

$$P(E_2/A) = \frac{P(E_2) \times P(A/E_2)}{P(E_1) \times P(A/E_1) + P(E_2) \times P(A/E_2)}$$

$$= \frac{\frac{3}{10} \times \frac{9}{10}}{\frac{7}{10} \times \frac{8}{10} + \frac{3}{10} \times \frac{9}{10}} = \frac{27}{83}$$

Ans. 27/83 Value: Pollution free environment minimize the health problems in the human being.

12. A chairman is biased so that he selects his relatives for a job 3 times as likely as others. If there are 3 posts for a job. Find the probability distribution for selection of persons other than their relatives. If the chairman is biased than which value of life will be demolished?

P(Selecting relatives, i.e., biased) = 3/4

P(Selecting non relatives, i.e., not biased) = 1/4

Event of selecting non relatives, X = 0, 1, 2, 3

$$P(0) = \frac{3}{4} \times \frac{3}{4} \times \frac{3}{4} \binom{3}{0} = \frac{27}{64}$$

$$P(1) = \frac{1}{4} \times \frac{3}{4} \times \frac{3}{4} \binom{3}{1} = \frac{27}{64}$$

$$P(2) = \frac{1}{4} \times \frac{1}{4} \times \frac{3}{4} \binom{3}{2} = \frac{9}{64}$$

$$P(0) = \frac{1}{4} \times \frac{1}{4} \times \frac{1}{4} \binom{3}{3} = \frac{1}{64}$$

Values lost by chairman –Honesty, Integrity

Ans:

x	0	1	2	4
p(x)	$\frac{27}{64}$	$\frac{27}{64}$	$\frac{9}{64}$	$\frac{1}{64}$

13. A manufacturer has three machine operators A (skilled) B (Semi- skilled) and C (nonskilled). The first operator A Produces 1% defective items where as the other two operators B and C produces 5% and 7 % defective items respectively. A is on the job for 50% of time B in the job for 30% of the time and C is on the job for 20 % of the time. A defective item is produced what is the probability that it was produced by B? What is the value of skill?

$$P(E_1) = P(\text{item produced by operator A}) = \frac{50}{100} = \frac{1}{2}; P(A/E_1) = \frac{1}{100}$$

$$P(E_2) = P(\text{item produced by operator B}) = \frac{30}{100} = \frac{3}{10}; P(A/E_2) = \frac{5}{100}$$

$$P(E_3) = P(\text{item produced by operator C}) = \frac{20}{100} = \frac{2}{10}; P(A/E_3) = \frac{7}{100}$$

Where A = Defective items .

$$P(E_2/A) = \frac{P(E_2) \times P(A/E_2)}{P(E_1) \times P(A/E_1) + P(E_2) \times P(A/E_2) + P(E_3) \times P(A/E_3)}$$

$$= \frac{\frac{3}{10} \times \frac{5}{100}}{\frac{5}{10} \times \frac{1}{100} + \frac{3}{10} \times \frac{5}{100} + \frac{2}{10} \times \frac{7}{100}} = \frac{15}{5+15+14} = \frac{15}{34}$$

Ans. 15/34 Value: skilled person can complete a work in better way than other person

14. In a group of 100 families, 30 families like male child, 25 families like female child and 45 families feel both children are equal. If two families are selected at random out of 100 families, find the probability distribution of the number of families feel both children are equal. What is the importance in the society to develop the feeling that both children are equal?

$$P(\text{families like male child}) = 30/100$$

$$P(\text{families like female child}) = 25/100$$

$$\text{i.e., } P(\text{families like any one of the child}) = 55/100 = 11/20$$

$$P(\text{families like both child}) = 45/100 = 9/20$$

Event : like both children $X = 0, 1, 2$.

$$P(0) = \frac{11}{20} \times \frac{11}{20} \times {}^2C_0 = \frac{121}{400}$$

$$P(1) = \frac{11}{20} \times \frac{9}{20} \times {}^2C_1 = \frac{198}{400}$$

$$P(2) = \frac{9}{20} \times \frac{9}{20} \times {}^2C_2 = \frac{81}{400}$$

Ans.

x	0	1	2
p(x)	$\frac{121}{400}$	$\frac{198}{400}$	$\frac{81}{400}$

To maintain the ratio of male and female equally. This is important to consider both children are equal.

15. In a group of 200 people, 50% believe in that anger and violence will ruin the country, 30% do not believe in that anger and violence will ruin the country and 20% are not sure about anything. If 3 people are selected at random find the probability that 2 people believe and 1 does not believe that anger and violence will ruin the country. How do you consider that anger and violence will ruin the country?
A = those who believe in that anger and violence will ruin the country

B = those do not believe in that anger and violence will ruin the country
C = those who are not sure about anything

$$P(A) = 50/100 ; P(B) = 30/100 ; P(C) = 20/100$$

$$P(2 \text{ people believe and } 1 \text{ does not believe}) = P(A) \times P(A) \times P(B) \times {}^3C_2$$

$$= \frac{50}{100} \times \frac{50}{100} \times \frac{30}{100} \times 3 = \frac{9}{40} = 0.225$$

Ans. 0.225, Value: People in anger cannot use their presence of mind and become violent and destroy public property in riots which is indirectly their own property.

16. In a group of students, 200 attend coaching classes, 400 students attend school regularly and 600 students study themselves with help of peers. The probability that a student will succeed in life who attend coaching classes, attend school regularly and study themselves with help of peers are 0.1, 0.2 and 0.5 respectively. One student is selected who succeeded in life, what is the probability that he study himself with help of peers. What type of study can be considered for the success in life and why?

$$P(E_1) = P(\text{attend coaching classes}) = \frac{200}{1200} = \frac{2}{12}; P(A/E_1) = \frac{1}{10}$$

$$P(E_2) = P(\text{attend school regularly}) = \frac{400}{1200} = \frac{4}{12}; P(A/E_2) = \frac{2}{10}$$

$$P(E_3) = P(\text{study themselves}) = \frac{600}{1200} = \frac{6}{12}; P(A/E_3) = \frac{5}{10}$$

Where A = Succeeded in life .

$$P(E_3/A) = \frac{P(E_3) \times P(A/E_3)}{P(E_1) \times P(A/E_1) + P(E_2) \times P(A/E_2) + P(E_3) \times P(A/E_3)}$$

$$= \frac{\frac{6}{12} \times \frac{5}{10}}{\frac{2}{12} \times \frac{1}{10} + \frac{4}{12} \times \frac{2}{10} + \frac{6}{12} \times \frac{5}{10}} = \frac{30}{2+8+30} = \frac{30}{40} = 0.75$$

Ans. 0.75, Value : self studies with the help of peers is best as through it students can get the knowledge in depth of each concept. But students should be regular in school and if they feel need they could join different classes