Previous (statistics/solution/grade-12/mathematics/187/solutions) Next (probability/solution/grade-12/mathematics/189/solutions)

Probability

14.1 (probability-14-1/solution/grade-12/mathematics/188/solutions)

14.2 (probability-14-2/solution/grade-12/mathematics/189/solutions)

14.1

1.

In a die, there are six faces of marked with 1,2,3,4,5,6

a.

n = Total number of possible cases = 3,

m = No. of favorable cases = 3.

Let P(E) = is the probability of getting even number, then

P(E) = $\mathrm{m.n}$ = $\frac{3}{6}$ = $\frac{1}{2}$.

Go Top

b.

n = Total number of possible cases = 6.

m = Total number of favorable cases (i.e. a number ≥ 3) = 4.

So, P(E) = Probability of getting a no. ≥ 3.

= $\frac{m}{n}$ = $\frac{4}{6}$ = $\frac{2}{3}$.

c.

n = Total no. of possible cases = 6.

m = total number of favorable cases(i.e. number ≤ 4) = 4.

Then, probability P(E) = $\frac{m}{n}$ = $\frac{4}{6}$ = $\frac{2}{3}$.

2.

Soln:

Let n(R) = No. of red balls = 9.

n(W) = No. of white balls = 7.

n(B) = No. of black balls = 4.

Then n(S) = Total no. of balls = 9 + 7 + 4 = 20,

a. Probability of getting red ball P(R) = $\frac{n(R)}{n(S)}$ = $\frac{9}{20}$.

b. Probability of red or white ball P (R or W) = $\frac{b(R)}{n(s)}$ + $\frac{n(W)}{n(S)}$ = $\frac{9}{20} + \frac{7}{20}$ = $\frac{16}{20}$ = $\frac{4}{5}$.

c. Probability of not getting a red ball,

Or, = 1 – P(R) = 1 – = .

3.

Soln:

Total no. of possible cases,n(S) = 52,

Total no. of spade,n(A) = 13,

Total no.of red 8,$n(R_1)$ = 2

Total no.of red 9,$n(R_2)$ = 2.

Total no.of red 10,$n(R_3)$ = 2

Total no.of king,n(K) = 4.

Total no. of diamond, n(D) = 13.

a. Probability of getting a spade, P(A) = $\frac{n(A)}{n(S)}$ = $\frac{13}{52}$ = $\frac{1}{4}$.

b. Probability of getting a red 8,red 9 or red 10.

P(R) = $\frac{n(R_1)+n(R_2)+n(R_3)}{n(S)}$ = $\frac{2+2+2}{52}$ = $\frac{3}{26}$.

c. Probability of getting a kind or a diamond,

P(K or D) = P(K) + P(D) – P(K and D)

= $\frac{n(K)}{n(S)}$ + $\frac{n(D)}{n(S)}$ – $\frac{n\left(K \cap^{D}\right)}{n(S)}$ = $\frac{4}{52} + \frac{13}{52} - \frac{1}{52}$ = $\frac{16}{52}$ = $\frac{4}{13}$.

Go Top

4.

Soln:

Total no. of students n(S) = 60,

Students participating one activity n(A) = 30.

Students participating at least one activities n(B) = 30 + 12 = 42.

a. Probability that a student selected participates in one activity,

or, P(A) = $\frac{n(A)}{n(S)}$ = $\frac{30}{60}$ = $\frac{1}{2}$.

b. Probability of students selected participate in at least one activities

or, P(B) = $\frac{n(B)}{n(S)}$ = $\frac{42}{60}$ = $\frac{7}{10}$.

5.

Soln:

Total no. of possible cases n(S) = 20.

No. of odd number n(O) = 10,

No. of multiple of 4 or 5, n(A) = 5 + 4 – 1 = 9 – 1 = 8.

a. Probability of getting odd number,

P(O) = $\frac{n(O)}{n(S)}$ = $\frac{10}{20}$ = $\frac{1}{2}$.

b. Probability of getting a multiple 4 or 5,

P(A) = $\frac{n(A)}{n(S)}$ = $\frac{8}{20}$ = $\frac{2}{5}$.

6

Soln:

a. The probability of getting grade A, i.e. P(A) = 0.57

and the probability of getting grade B i.e., P(B) = 0.34

So, the probability that the student will get grade A or B

b. There are only three grades A,B and C,

Then the probability of getting grade C,

P(C) = 1 – {P(A) + P(B)} = 1 – 0.91 = 0.09.

Go Top

7.

a.

We have,

$P(A \cap B) = P(A) + P(B) – P(AUB)$

$= 0.4 + 0.35 – 0.55 = 0.75 – 0.55 = 0.20$

And, $P(A).P(B) = 0.4 * 0.35 = 0.140$.

Here, $P(A \cap B) \neq P(A).P(B)$.

So, A and B are not independent.

b.

If A and B are two independent events, then

$P (A \cap B) = P(A) * P(B) = \frac{2}{3} * \frac{3}{5} = \frac{2}{5}$.

So, $P(A \cup B) = P(A) + P(B) – P(A \cap B) = \frac{2}{3} + \frac{3}{5} - \frac{2}{5} = \frac{10+9-6}{15} = \frac{13}{15}$.

8.

Soln:

If two coins are tossed simultaneously then, sample space,

i.e n(S) = {HH,HT,TH,TT}

(i) Probability of getting both heads = $\frac{m}{n} = \frac{1}{4}$.

(ii) Probability of getting at least one head = $\frac{m}{n} = \frac{3}{4}$.

9.

Soln:

Total no.of students n(S) = 60 + 40 = 100.

(i) P(both boys) = ${}^{60}C_2/{}^{100}C_2 = \frac{60}{100} * \frac{59}{99} = \frac{59}{165}$.

(ii) P(both girls) = ${}^{40}C_2/{}^{100}C_2 = \frac{40}{100} * \frac{39}{99} = \frac{26}{165}$.

(iii) P(one boy and one girl) = $({}^{60}C_1 * {}^{40}C_1)/({}^{100}C_2) = \frac{60*40}{\frac{100}{2} * \frac{99}{1}} = \frac{16}{33}$.

10.

Soln:

Total no.of balls = 8 + 4 = 12.

a.

No. of favorable cases = No. of selection of 1 white from 8 white balls and 1 red from 4 red balls. = ${}^{8}C_1 * {}^{4}C_1$.
Total no. of possible cases = ${}^{12}C_2$

So, P(One of each colour) = $({}^{8}C_1 * {}^{4}C_1)/({}^{12}C_2) = \frac{8*4}{\frac{12}{12} * \frac{11}{1}} = \frac{8*4*2}{12*11} = \frac{16}{33}$.

Go Top

b.

Probability of getting both balls are of same colour,

= P(WW) + P(BB)

= $^8C_2/^{12}C_2 + {}^4C_2/^{12}C_2 = \frac{8*7}{12*11} + \frac{4*3}{12*11} = \frac{14}{33} + \frac{3}{33} = \frac{17}{33}$.

11.

Soln:

Two dice are rolled once. So, total no.of possible cases.

n = 36,

a. No. of favorable cases in this case(m) = 5 because, 2 + 6, 3 + 5,4 + 4,5 + 3,6 + 2 becomes a total of 8.

So, required probability = $\frac{m}{n} = \frac{5}{36}$.

b. No. ofpossible cases = 9.

Since, 3 + 6, 4 + 5, 5 + 5, 6 + 3 and 1 + 5, 2 + 4, 3 + 3, 4 + 2, 5 + 1.

So, required probability = $\frac{m}{n} = \frac{9}{36} = \frac{1}{4}$.

12.

Soln:

Total no. of possible cases,n = 7 + 6 = 13.

No. of favorable cases (m) = Selecting two men from 7 men and 1 women from 6 women.

= $^7C_2 * {}^6C_1$.

So, required probability = $\frac{m}{n} = ({}^7C_2 * {}^6C_1)/{}^{13}C_3$.

= $\frac{\frac{7}{2}*\frac{6}{1}*\frac{6}{1}}{\frac{13}{3}*\frac{12}{2}*\frac{11}{1}} = \frac{7*6*6*3*2*1}{2*1*1*13*12*11} = \frac{63}{143}$.

13.

Soln:

Total no. of possible cases (n) = 52.

a. Possible no. of favorable cases (m) = $^{13}C_4$

So, required probability = $\frac{m}{n} = {}^{13}C_4/{}^{52}C_4 = \frac{13*12*11*10}{52*51*50*49} = \frac{41}{4165}$.

b. No. of possible favorable cases (m) = $^{26}C_4$.

So, required probability = $\frac{m}{n} = {}^{26}C_4/{}^{52}C_4 = \frac{26*25*24*23}{52*51*50*49} = \frac{46}{883}$.

c. m = No. of favorable cases

Go Top

= No. of selection of 3 red cards from 26 cards and 1 remaining black card from 26 cards.

= C(26,3) * C(26,1)

= $\frac{26*25*24}{3*2*1} * \frac{26}{1}$ = 26 * 25 * 4 * 26.

P (3 red cards) = $\frac{m}{n}$ = $\frac{26*25*4*26}{13*17*25*49}$ = $\frac{208}{833}$.

14.

Soln:

Let the probability for A to solve the problem P(A) = $\frac{3}{5}$ and the probability for B to solve the problem P(B) = $\frac{2}{3}$.

(i) Probability of the problem solved by A and B

P(A and B) = P(A) * P(B) = $\frac{3}{5}*\frac{2}{3}$ = $\frac{2}{5}$.

(ii) Probability of the problem to be solved

P(A or B) = P(A U B) = P(A) + P(B) – P(A and B)

= $\frac{3}{5}+\frac{2}{3}-\frac{2}{5}$ = $\frac{9+10-6}{15}$ = $\frac{13}{15}$.

15.

Soln:

Probability of solving by A = $\frac{1}{3}$.

Probability of not solving by A = 1 – $\frac{1}{3}$ = $\frac{2}{3}$.

Probability of solving B = $\frac{1}{4}$.

Probability of not solving by B = 1 – $\frac{1}{4}$ = $\frac{3}{4}$.

Probability of solving by C = $\frac{1}{5}$.

Probability of not solving problem by C = 1 – $\frac{1}{5}$ = $\frac{4}{5}$.

SO, probability of solving problem by none of them

= $\frac{2}{3}.\frac{3}{4}.\frac{4}{5}$ = $\frac{2}{5}$.

So, probability that the problem is solved:

= 1 – $\frac{2}{5}$ = $\frac{3}{5}$.

16.

Soln:

We know,

$P(E_1 \cap E_2) = P(E_1) + P(E_2) – P(E_1 \cup E_2) = 0.24 + 0.36 – 0.5 = 0.1$

So, $P(E_1/E_2) = \frac{P(E_1 \cap E_2)}{P(E_2)} = \frac{0.1}{0.36} = \frac{10}{36} = \frac{5}{18}$.

And $P(E_2/E_1) = \frac{P(E_1 \cap E_2)}{P(E_1)} = \frac{0.1}{0.24} = \frac{5}{12}$.

17.

Soln:

Total no. of possible cases = 10.

And no. of defective cases = 3.

So, the probability that all three are defective = $\frac{m}{n}$ = ${}^3C_3/{}^{10}C_3$ = $\frac{3*2*1}{10*9*8}$ = $\frac{1}{120}$.

Go Top

18.

Soln:

Total no. of balls = 6 + 8 = 14.

a. Probability of getting the first is white and second is blue = $\frac{6}{14} * \frac{8}{13}$ = $\frac{24}{91}$.

b. No. of favorable cases (m) = ${}^6C_2$

Total no. of possible cases (n) = ${}^{14}C_2$.

So, required probability = $\frac{m}{n}$ = ${}^6C_2/{}^{14}C_2$ = $\frac{6*5}{14*13}$ = $\frac{15}{91}$.

19.

Soln:

Total no. of balls = 4 + 5 + 6 = 15.

n = Total no. of possible cases.

= No. of selection of 2 balls out of 15.

= C(15,2) = $\frac{15*14}{2*1}$ = 15 * 7.

a. P(both are of same color) = P(both white) + P(both red) + P(both black)

= $\frac{C(4,2)}{C(15,2)} + \frac{C(5,2)}{C(15,2)} + \frac{C(6,2)}{C(15,2)}$.

= $\frac{\frac{4*3}{2}}{15*7}$ + $\frac{\frac{5*4}{2}}{15*7}$ + $\frac{\frac{6*5}{2}}{15*7}$ = $\frac{6+10+15}{15*7}$ = $\frac{31}{105}$.

b. m = No. of favorable cases = No. of selection of 1 white balls from 4 and rest 1 from 11.

= C(4,1) * C(11,1)

= 4 * 11

P(one white) = $\frac{m}{n}$ = $\frac{4*11}{15*7}$ = $\frac{44}{105}$.

c. P(different colours) = 1 – P(same colours) = 1 – $\frac{31}{105}$ = $\frac{74}{105}$.

Previous (statistics/solution/grade-12/mathematics/187/solutions) Next (probability/solution/grade-12/mathematics/189/solutions)

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Pastpaper (?type=pastpapers#middle)

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BLOG

FORUM (forum)

Go Top