## Chapter 66 Answers

1.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 1/36 | 2/36 | 3/36 | 4/36 | 5/36 | 6/36 | 5/36 | 4/36 | 3/36 | 2/36 | 1/36 |

For example, a total of 9 can be obtained in 4 ways (3,6) (4,5) (5,4) 6,3) so chance of 9 is 4/36.

2. Use the Law of Total Probability

P(9 on three dice) = P(1 on first die)\*P(8 on last 2) + P(2 on first die)\*P(7 on last 2) + P(3 on first die)\*P(6 on last 2) + P(4 on first die)\*P(5 on last 2) + P(5 on first die)\*P(4 on last 2) + P(6 on first die)\*P(3 on last 2) .

1/6(5/36) +1/6(6/36) + 1/6(5/36) + 1/6(4/36) + 1/6(3/36) +1/6(2/36) =25/216

3. P(baseball or basketball) = P(baseball) + P(basketball) -P(plays both) = .20 + .15 -.05 =.30

4. P(A and B) = 1/6 and P(A)\*P(B) = (1/2)\*(1/3) = 1/6 so these events are independent.

5. Yes these events cannot occur together.

6. Suppose A and B are mutually exclusive. Then P(A and B) = 0 which is not equal to P(A)\*P(B). Therefore, events A and B cannot be independent.

7. These events are mutually exclusive so P(7 or 11) = P(7) + P(11) =8/36 = 2/9.

8. P(both are clubs) = P(1st card is club)\*P(2nd card is club|1st card is club)= (13/52)\*(12/51) = 1/17

9. P (win at least once) = 1- P(never win) = 1- (37/38)25 = 0.49.

10. Define

B = Event adult watches Bachelor

M = Event adult is a man

W = Event adult is a woman

NB = Event adult does not watch the Bachelor

Now calculate the fraction of all adults falling into each of these categories. Note

P(B and Woman) = P(B)P(W|B) = (0.10)(0.8) = 0.08

Since 1st row must add to 0.10 and 1st column must add to 0.50 we may calculate all probabilities as shown below.

|  |  |  |
| --- | --- | --- |
|  | W | M |
| B | 0.08 | 0.02 |
| NB | 0.42 | 0.48 |

11. We must compute P(B|W) and P(B|M).

P(B|W) =0.08/0.50 = 0.16 and P(B|M) = 0.02/0.50 = 0.04. In other words, 16% of all women and 4% of all men are Bachelor Viewers.

12.

From table

|  |  |  |
| --- | --- | --- |
|  | Engine Problem | No Engine Problem |
| FL | 0.04 | 0.01 |
| No FL | 0.095 | 0.855 |

P(FL|Engine Problem) = 0.04/(0.04 + 0.095) = 8/27.

13. Let G = event drawer you drew from has two golds. The prior probabilities are P(G) = P(Not G) = 1/2. The likelihoods are P(Gold drawn|G) = 1 and P(Gold Drawn|Not G) = 0.5.

Now P(G|Gold drawn) = = = 2/3.

14. Prior Probabilities are P(Green) = 0.15 and P(Blue) = 0.85.

Likelihoods are P(Says Green|Green) = 0.8 and P(Says Green|Blue) = 0.2

Now P(Green|says Green) = = = = 12/29 = 0.41, not 0.80!!

15. Once you draw the first number there is simply a 1/9 chance that you match the first number.

16. P(A and B) is just 1/6 so answer is = 1/3

17. For series system answer is (0.9)2 =0.81.

For parallel system P(system work) = P(at least one engine works) = 1- P(both fail) = 1 - (0.1)2 = 0.99.

18.

|  |  |  |
| --- | --- | --- |
|  | Men | Women |
| Easy Major | 864 (1386) | 106 (133) |
| Difficult Major | 334 (1306) | 451 (1702) |

You can see that 1198/2692 = 45% of men and 557/1835 = 30% of women have been admitted. But in each major a greater percentage of women are admitted than men. Easy majors 864/1386 = 62% of men and 106/133 = 80% of women are admitted and in Difficult Majors 334/1306 = 25.5% of mean and 451/1702 = 26.4% of women have been admitted So why overall was a smaller percentage of women admitted? Because a much larger fraction of women (93%) than men (49%) chose the Difficult major which is harder to get into. This fact tends to reduce the overall percentage of women admitted.

19. P(H) = .7, P(D) = .3, P(A|H) = .03, P(A|D) = .05

.7\*.03

P(H|A)= ----------------- = .58333

.7\*.03 +.3\*.05

20. P(At least one A) = 1 –P(No A’s) = 1 – (.1)\*(2) = 0.98.

(6/10)\*(5/9)

21. P(1st Blue|2nd Blue) = ----------------------------= 5/9.

(6/10)

22. P(A and B) = 1/36, P(A) = 1/6, P(B) – 5/36, P(A)\*P(B)= 5/216 which is not equal to 1/36, so events A and B are not independent.

23. P(HR) = .8, P(LR) = .2, P(A|HR) = .10, P(A|LR) = .03,

.8\*.1

P(HR|A) =----------------------------- = .93.

.8\*.1+.2\*.03

24. P(>=1 #16 wins) = 1- P(No #16 wins) = 1 - .974 = .114.

25, P(Lie) = .001, P(Not Lie) = .999, P(Tests says lie|lie) = .98, P(Test says lie|not lie) = .02.

P(Lie)\*P(Not says lie|lie)

P(Lie|test says lie) = ------------------------------------

P(Lie)\*P(Not says lie|lie)+P(Not Lie)\*P(Test says lie|not lying)

= .001\*.98

---------------------------- = .0467.

.001\*.98\_.999\*.02

26. P(A) = .5 P(B) = 1/6 The only way A and B can happen is (5,1) (5,3) and (5,5) which has probability 3/36. P(A)\*P(B) = 1/12 so events A and B are independent.

27. P(Display or price cut) = P(Display) + P(Price cut) – P(Display and price cut) = .40 + .20 -.15 = .45.

28. P(1st card is 2 of hearts|both are hearts)

= P(1st card is 2 of hearts and both are hearts)

P(both are hearts)

(1/52)\*(12/51)

= ---------------------------- = 1/13.

(13/52)\*(12/51)

29. P(Normal) =2/3, P(Two Headed) = 1/3, P(Heads|two headed) =1, P(Heads|Normal) = .5

P(Heads|two headed quarter)\*P(two heads)

P(Two Heads|Heads) = -------------------------------------------------------------------

P(Heads|two headed quarter)\*P(two heads)+P(Normal)\*P(Heads|Normal)

1/3

= ------------------=.5.

2/3

30. P(A and B) = 1/36, P(A) = 3/36, P(B) = .5. Thus P(A)\*P(B) is not equal to P(A and B), so events A and B are not independent.

31. P(HR) =.2, P(LR) = .5, P(IR) = .4, P(A|LR) = .02, P(A|HR) = .20, P(A|MR) = .04

.2\*.2

P(HR|A)= -------------------------------------= .625.

.2\*.2 \_.4\*.04 +.4\*.02