Homework 3

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Q1:

1. Let = “life over 10,000 miles”, = “life over 20,000 miles”, = “life over 30,000 miles”,

then = 0.8, = 0.4, = 0.1

= = 0.5

Therefore, the probability that its total life will exceed 20,000 miles is 0.5

1. The question can be rephrased in following way: “its total life will exceed 30,000 miles?”

= = 0.125

Q2:

(select a white ball) =

Case 1: Each urn has the same number of black and white balls (e.g. 3 black and 3 white in urn 1; 7 black and 7 white in urn 2), then always () =

Case 2: If the number of balls in two urns are different, i.e. one of the urns has more white balls than black balls. (Here we assume that there are more black balls (let it be ) and less white balls (let it be ) in urn 1. )

So, .

Let = “there is at least one black ball in each urn”, then .

Therefore, .

In other case that “there is not at least one black ball in each urn”, e.g. 1 white balls, 0 black balls in urn 1 and 9 white balls, 10 black balls in urn 2. The probability of this example case is greater than 0.73. Even we increase the number of white balls in the urn 1, it will not change the probability of selecting white ball from urn 1 and but will lower the probability of selecting white ball from the urn 2.

Question 3:

Let = The transferred ball is white, = The final selected ball is white

then , = .

Therefore, =

The probability that the transferred ball was white is 0.8.

Question 4:

Let A = first call drawn was black, B = second ball drawn was red.

Then P() = , P() = , P(=

Therefore, =

The probability that the first call drawn was black, given that the second ball drawn was red is .

Question 5:

Let A = these selected two cards are aces, P() =

1. Let B = one of cards is ace spade, P() = , P() = ,

Therefore, =

1. Let C = the first selected card is ace, P() = , P() =

Therefore, =

1. Let D = the second selected card is ace, P() = , P() =

Therefore, =

1. Let E = either of cards is ace, P() = 1 - , P() =

Therefore, =

Question 6:

According to the problem, before observing the evidence, .

Besides, having the new evidence that , we will have

Therefore, is 1.5 times as likely.

Question 7:

1. P(the plant is alive) = = 0.785
2. P(the plant is dead) = 1 – P(alive) = 0.215,

P(dead plant and forget to water) = = 0.08

P(dead plant and forget to water | the plant is dead) =

Question 8:

According to the problem, the gene of parents of this rat must be Gg, where G represent black dominate gene and g represent brown gene. Because this rat has a brown sibling with gene of gg.

1. P(pure black gene) = , P(black rat) = .

Therefore, P(pure black gene | black rat) =

1. According to the A. the probability that this black rat has pure black gene is and the probability that this black rat has hybrid gene is .

If this rat is pure, the chance that all his 5 offspring are black is 100%

If this rat is hybrid, the chance that all his 5 offspring are black is .

(all offspring are black) =

(pure black rat and all offspring are black) =

(pure black rat | all offspring are black) =

Therefore, the probability that the rat is a pure black rat is .