* 1. E[f(x)]=10\*( P (f(x=a) ) + 5\*(P (f(x=b) )+ 10/7\*(P (f(x=c) ) = 10\*0.1 + 5\*0.2 + 10/7 \* 0.7 = 3
  2. E[1/p(x)]=Sum of f(x)\*p(x) for all values in our event space. In this case we let f(x)= 1/p(x), this leads to us E[1/p(x)]= 1 as p(x)\*1/p(x) is 1. Since we need to sum this for all the possible outcomes we get 1+1+1=**3**
  3. E[1/p(x)]=Sum of f(x)\*p(x) for all values in our event space. In this case we let f(x)= 1/p(x), this leads to us E[1/p(x)]= 1 as p(x)\*1/p(x) is 1. Since we need to sum this for all the possible outcomes we get the number of events in outcomes in our event space of Ω
  4. E[f(x)]2=32 =**9.**

E[f(x)2]) ]=102\*( P (f(x=a) ) + 52\*(P (f(x=b) )+ (10/7)2\*(P (f(x=c) ) = 100\*0.1 + 25\*0.2 + 100/49 \* 0.7 = **115/7**

|  |  |
| --- | --- |
| Number of Heads f(x) | Probability |
| 0 | **0.09375** as 0.25\*0.5\*0.75 |
| 1 | **0.40625** as 0.75\*0.5\*0.75+0.25\*0.5\*0.75+ 0.25\*0.5\*0.25 |
| 2 | **0.40625** as 0.75\*0.5\*0.75+0.75\*0.5\*0.25+ 0.25\*0.5\*0.25 |
| 3 | **0.09375** as 0.75\*0.5\*0.25 |

E[f(x)]= 0\*( P (f(x=0) ) + 1\*(P (f(x=1) )+ 2\*(P (f(x=2) ) + 3\*(P (f(x=3) ) = 0\*0.09375+1\*0.40625+2\*0.40625 + 3\*0.09375=**1.5**

* 1. P (D=3 Heads and 2 Tails|Coin C)= 1/3\*0.253\*0.752=27/1024\*1/3=9/1024

P(Coin C)=1/3

P(3 Heads and 2 Tails)= ∑( P(Coin x) \*P(D= 3Heads an 2 Tails| Coin X) ) for Coins 1 through 3

=1/3( 0.753\*0.252 + 0.253\*0.752 + 0.55)= 17/768

P(Coin C|D=3 Heads and 2 Tails) = (D=3 Heads and 2 Tails|Coin C)\* P(Coin C) / P(3 Heads and 2 Tails)

= (9/1024) \* (1/3) / ( 17/768)

=**9/68** which is approximately **0.1324**

A piece of paper with writing on it

Description automatically generated

Graphical user interface, text, application

Description automatically generated

* 1. M1 = **-0.36765570008662163**

M2 = **0.11300833983617294**

M3= **-0.24022326465495789**

M4 = **0.019260783568607387**

M5 = **0.07629033233553006**

Sample Mean= : **-0.07986390180025382**

Sample Variance = 1/n-1 \* Sum of (Mi – Mean of all Samples)2 for i 1 through 5 = **0.044987198524484295**

* 1. M1 = **-0.0960278368670425**

M2 = **-0.14489137317954603**

M3= **0.02073962288722332**

M4 = **-0.08243784036119553**

M5 = **-0.06508023292221407**

Sample Mean= **-0.07353953208855497**

Sample Variance = 1/n-1 \* Sum of (Mi – Mean of all Samples)2 for i 1 through 5 = **0.0036590269435829016**

The difference between the sample variance from b and c is that the variance from c) will be very small compared to that of b) as we are dealing with more samples for the same distribution and standard deviation for the sample function.

* 1. Sample Average : -3.9691977432325816. Given this sample mean, we want to get the 95% confidence interval round this sample value yet we do not know the true mean value but we do know the standard deviation of 10 and it has a gaussian distribution. To get this interval we use the formula Sample mean +- z\*( σ/√n) where z is the z score for the confidence level of 0.95 which is 1.96. This gives us the confidence interval of **(-3.9691977432325816 - (49√30)/75** , **-3.9691977432325816 + (49√30)/75) which is approximately ( -7.548, -0.391)**
  2. Sample Average : -3.9691977432325816. Given this sample mean, we want to get the 95% confidence interval round this sample value yet we do not know the true mean value nor we do know the distribution is Gaussian. However, we do know the standard deviation is still 10. To get this interval we need to get ε = sqrt( (σ2)/nδ ) where in this case δ=0.05 n=30 σ=10. This leads us to get ε = (10√6)/3 which is approximately 8.1650. This leads us to have a confidence interval of **(-3.9691977432325816 - (10√6)/3, (-3.9691977432325816 +(10√6)/3) which is approximately (-12.134,4.196)**

Diagram

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