1- The length of certain bricks(x) is a random variable with a mean of **8** inches and a standard deviation of **0.1** inch, and the thickness of the mortar(y) between two bricks is a random variable with a mean of **0.5** inch and a standard deviation of **0.03** inch. What is the mean and the standard deviation of the length of a wall made of **50** of these bricks laid side by side, if we can assume that all the random variables involved are independent?

$z = \Sigma x_i + \Sigma y_j$ where z is RV (the length of a wall) i = 1 to 50 and j = 1 to 49

E{z} = 50 8+49 0.5 = 424.5 inches

var (ax+by) = a^2 var(x) + b^2 var(y) + 2ab cov(x,y) (if x and y are dependent)

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var: variance, σ^2 covariance $cov(X,Y)=E(XY)-\mu_x\mu_y$ std: standard deviation, σ

var (z) = 50 $(0.1)^2$ + 49 $(0.03)^2$ = 0.5441 and std(z) = 0.738 inches

2- If **heads** is success when we flip a coin, getting a **six** is a success when we roll a die, and getting an **ace** is a success when we draw a card from ordinary deck of 52 playing cards, Find the mean and the standard deviation of the total number of successes when we

a) Flip a balanced(**fair**) coin (**x**), roll a fair die(**y**), and then draw a card from a well-shufled deck(**z**),
b) Flip a balanced coin **three** times, roll a balanced die **twice**, and then draw a card from a well shuffled deck.

Hint: Bernoulli trials, mean = np and variance = npq where q=1-p

a) E {x+y+z} =1/2 + 1/6 + 1/13 = 58/78 = 0.74

var (x+y+z) = 1/4 + 5/36 + 12/169 = 0.46, std (x+y+z) = 0.68

n=1, H/T COIN p=q=0.5, DIE p=1/6, q=5/6, CARD p=1/13, q=12/13

b) E {3x+2y+z} = 3*1/2 + 2* 1/6 + 1/13 = 149/78 =1.91

var (3x+2y+z) = 3^2*1/4 + 2^2*5/36 + 12/169 = 2.8766

std (3x+2y+z) = 1.6961

3- If we alternately flip a **fair** coin and an **unfair** coin (probability of getting heads is **0.45**), what are the mean and the standard deviation of the number of **heads** that we obtain in **10** successive flips of these coins?
n=5, 5 fair and 5 unfair flips = 10 successive

μ= 5 (0.5) + 5 (0.45) = 4.75

σ^2 = 5^2 $(0.5)^2$ + 5^2 (0.45)(0.55) = 12.4375 σ = 3.5267