Chapter 5: Discrete Probability Distributions

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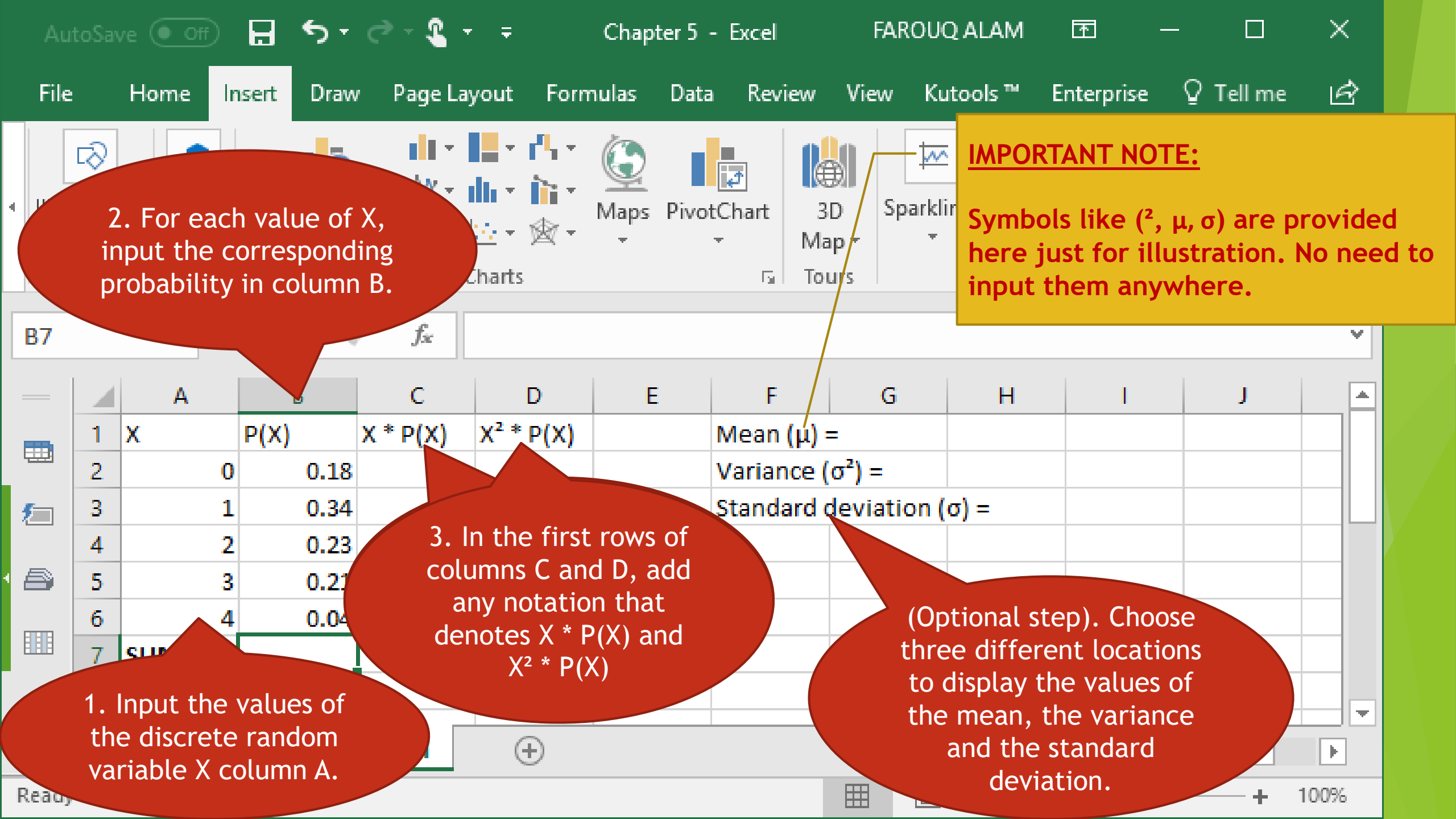
Part 1: Calculations using MS Excel only.

5 – 2 Mean, Variance, Standard Deviation, and Expectation

- **Example 5-11, page 269:**

X	0	1	2	3	4
P(X)	0.18	0.34	0.23	0.21	0.04

- **Calculate the mean, variance, and standard deviation from the above discrete probability distribution.**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B7
2. For each value of X, input the corresponding probability in column B.
IMPORTANT NOTE:
Symbols like (², μ, σ) are provided here just for illustration. No need to input them anywhere.
X
P(X)
X * P(X)
X² * P(X)
Mean (μ) =
Variance (σ²) =
Standard deviation (σ) =
0 0.18
1 0.34
2 0.23
3 0.2
4 0.0
3. In the first rows of columns C and D, add any notation that denotes X * P(X) and X² * P(X)
1. Input the values of the discrete random variable X column A.
(Optional step). Choose three different locations to display the values of the mean, the variance and the standard deviation.
Ready
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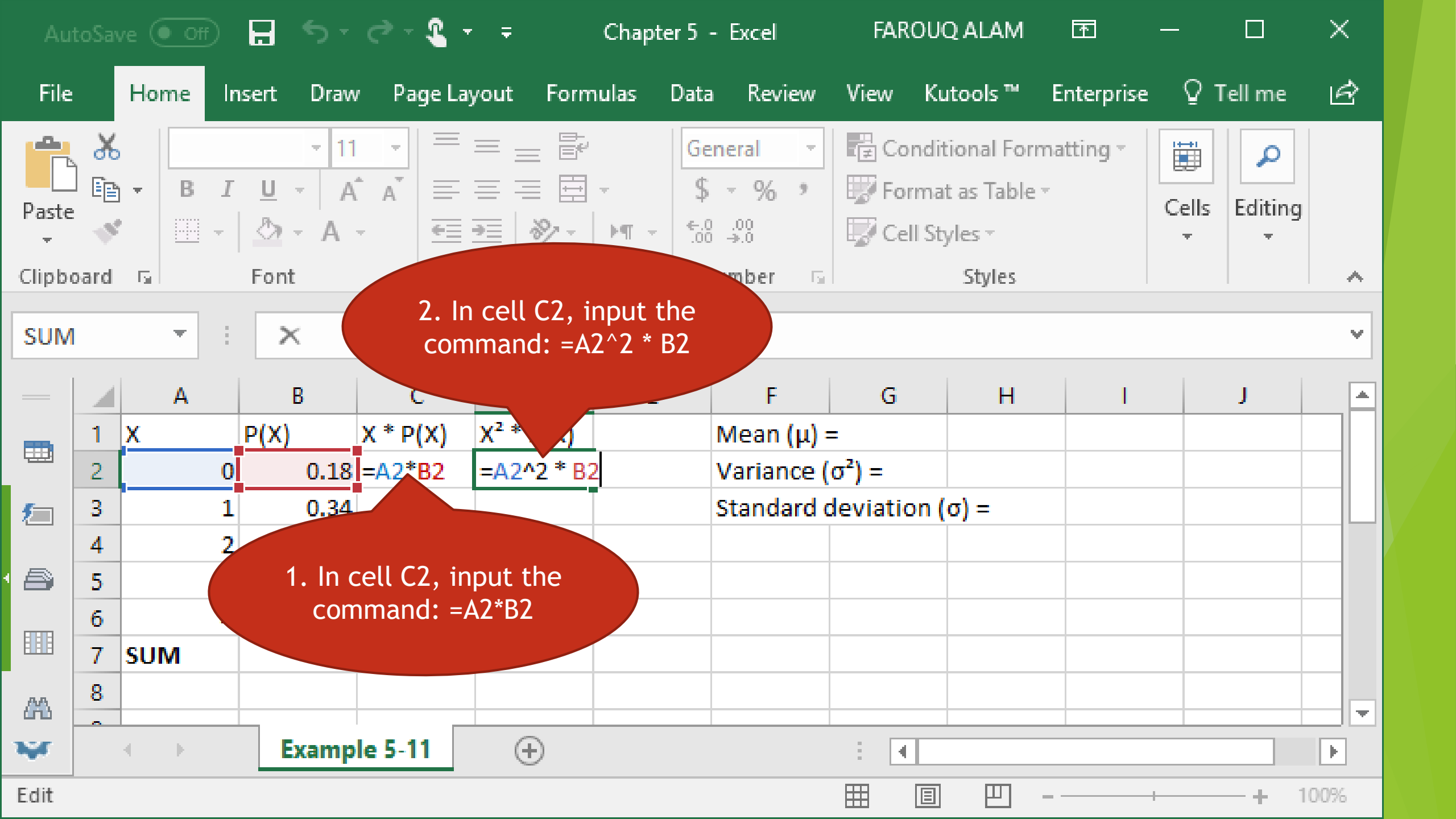
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SUM
2. In cell C2, input the command: =A2^2 * B2
1. In cell C2, input the command: =A2*B2
X
P(X)
X * P(X)
Mean (μ) =
Variance (σ²) =
Standard deviation (σ) =
0
0.18
=A2*B2
=A2^2 * B2
1
0.34
2
SUM
Example 5-11
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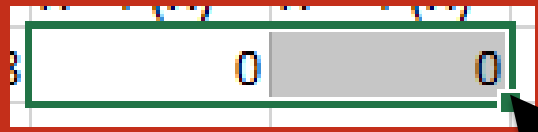
C2 | =A2*B2

	A	B	C	D
1	X	P(X)	X * P(X)	X^2 * P(X)
2	0	0.18	0	0
3	1	0.34	0.34	0.34
4	2	0.23	0.46	0.92
5	3	0.21	0.63	1.89
6	4	0.04	0.16	0.64
7	SUM			
8				

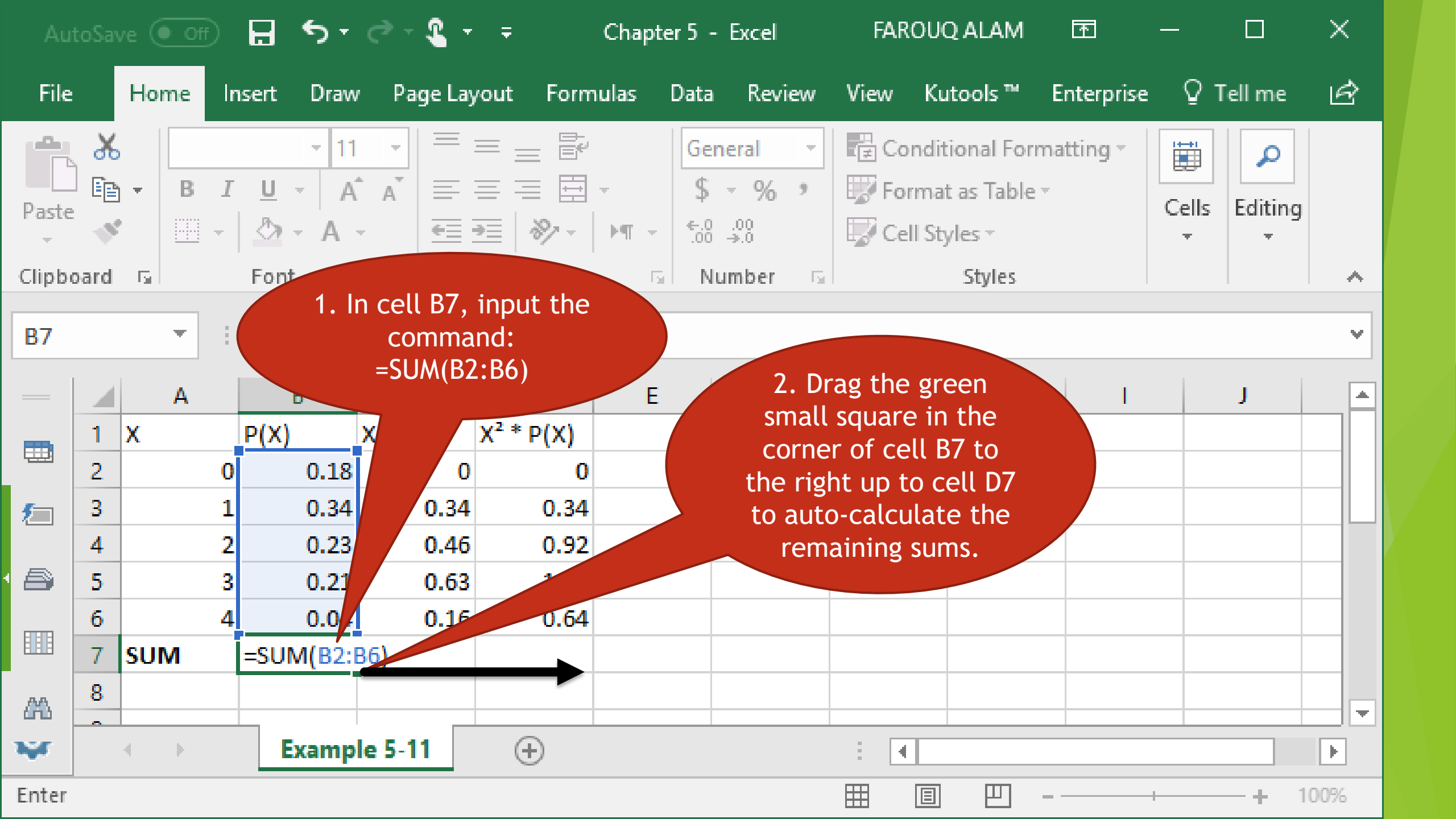
Example 5-11

Drag over sheet tabs to move cells b... Average: 0.538 Count: 10 Sum: 5.38 100%

Highlight cells C2 and D2 as follows:



Move the pointer to the green square as shown above. The pointer should change to the shape +. Use the new shape to drag down the highlight to row number 6 to auto-calculate all X * P(X) and X^2 * P(X).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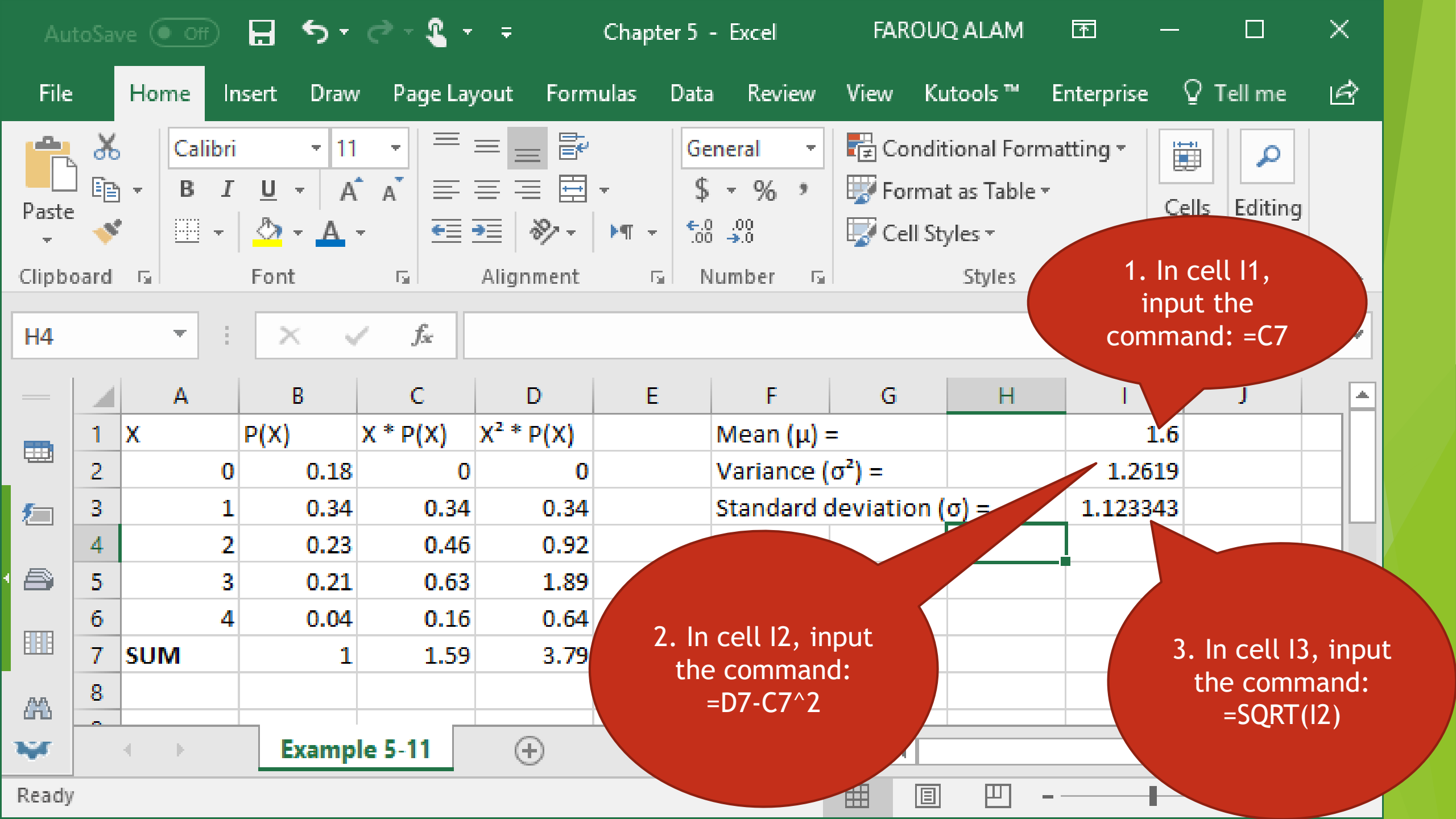
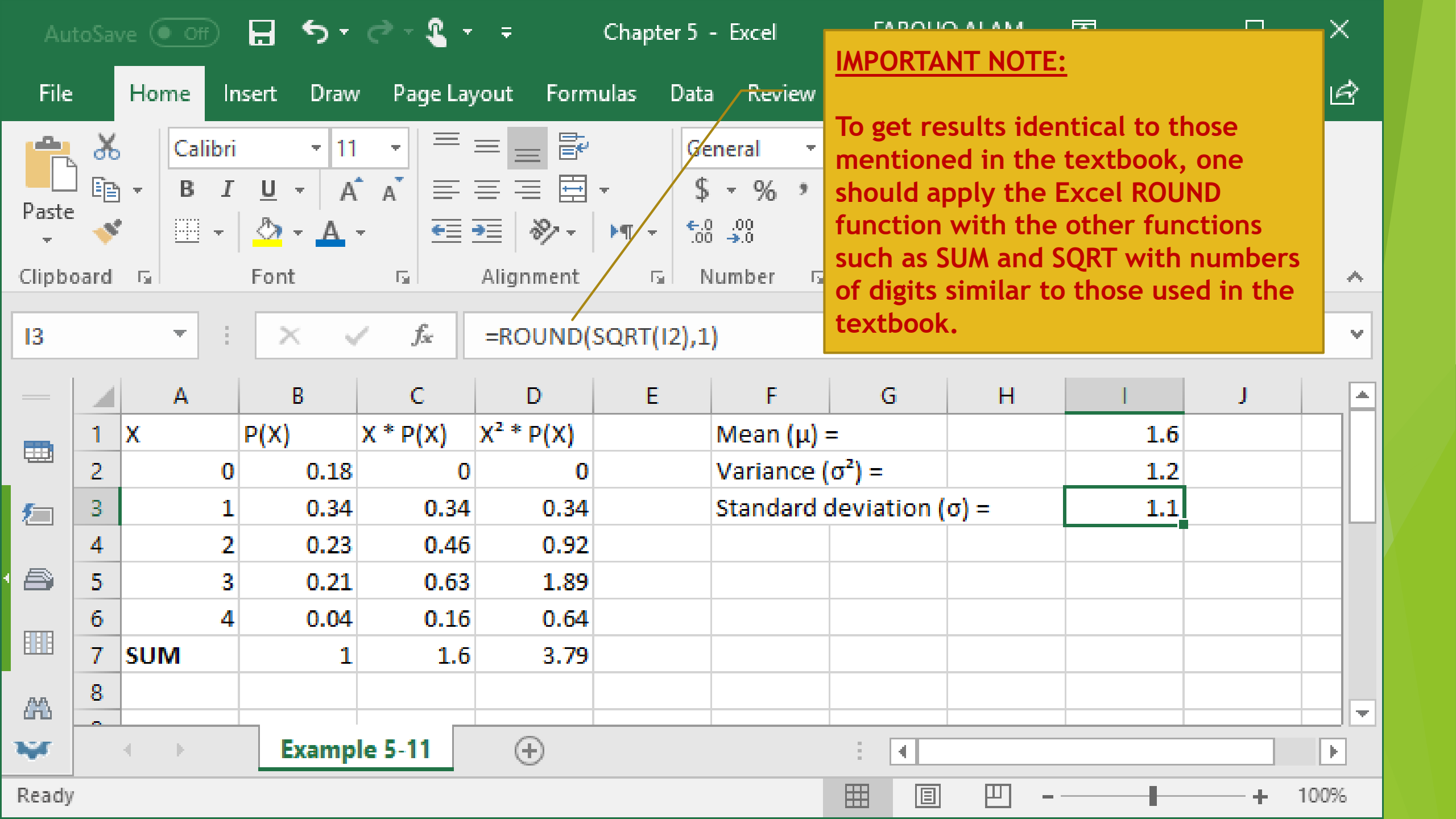
B7
1. In cell B7, input the command: =SUM(B2:B6)
2. Drag the green small square in the corner of cell B7 to the right up to cell D7 to auto-calculate the remaining sums.
X
P(X)
X
X² * P(X)
0 0.18 0 0
1 0.34 0.34 0.34
2 0.23 0.46 0.92
3 0.21 0.63
4 0.0 0.16 0.64
SUM
=SUM(B2:B6)
Example 5-11
Enter
100%



	A	B	C	D	E	F	G	H	I	J
1	X	P(X)	X * P(X)	X^2 * P(X)		Mean (μ) =			1.6	
2	0	0.18	0	0		Variance (σ^2) =			1.2619	
3	1	0.34	0.34	0.34		Standard deviation (σ) =			1.123343	
4	2	0.23	0.46	0.92						
5	3	0.21	0.63	1.89						
6	4	0.04	0.16	0.64						
7	SUM	1	1.59	3.79						
8										



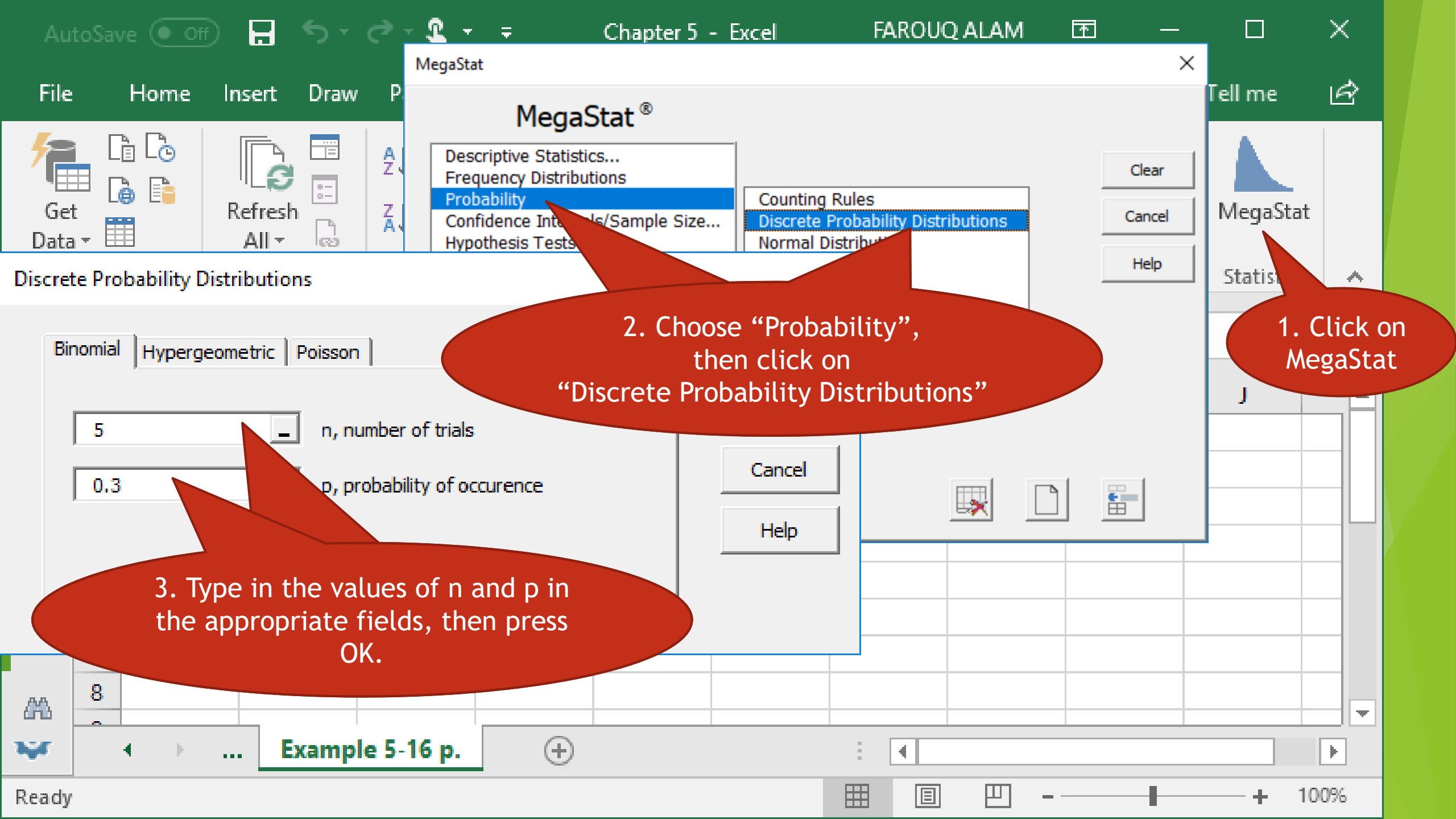
	A	B	C	D	E	F	G	H	I	J
1	X	P(X)	X * P(X)	X² * P(X)		Mean (μ) =			1.6	
2	0	0.18	0	0		Variance (σ^2) =			1.2	
3	1	0.34	0.34	0.34		Standard deviation (σ) =			1.1	
4	2	0.23	0.46	0.92						
5	3	0.21	0.63	1.89						
6	4	0.04	0.16	0.64						
7	SUM	1	1.6	3.79						
8										

Part 2: Calculations using MS Excel add-in MegaStat.

5 – 3 The Binomial Distribution

- **Example 5-18, page 279:** A survey from Teenage Research Unlimited (Northbrook, Illinois) found that **30%** of teenage consumers receive their spending money from part-time jobs. If **5** teenagers are selected at random, find **the probability that at least 3 of them will have part-time jobs**.

- Notice that n = 5, p = 0.3, X represents the number of teenagers, X = 0, 1, 2, 3, 4, 5, and the aim is to calculate P(at least 3 of teenagers will have part-time jobs) = $P(X \geq 3)$.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MegaStat
MegaStat ®
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Frequency Distributions
Probability
Confidence Int.../Sample Size...
Hypothesis Tests
Counting Rules
Discrete Probability Distributions
Normal Distrib...
Clear
Cancel
Help
1. Click on MegaStat
2. Choose "Probability", then click on "Discrete Probability Distributions"
Discrete Probability Distributions
Binomial
Hypergeometric
Poisson
5
n, number of trials
0.3
p, probability of occurence
Cancel
Help
3. Type in the values of n and p in the appropriate fields, then press OK.
Example 5-16 p.
Ready
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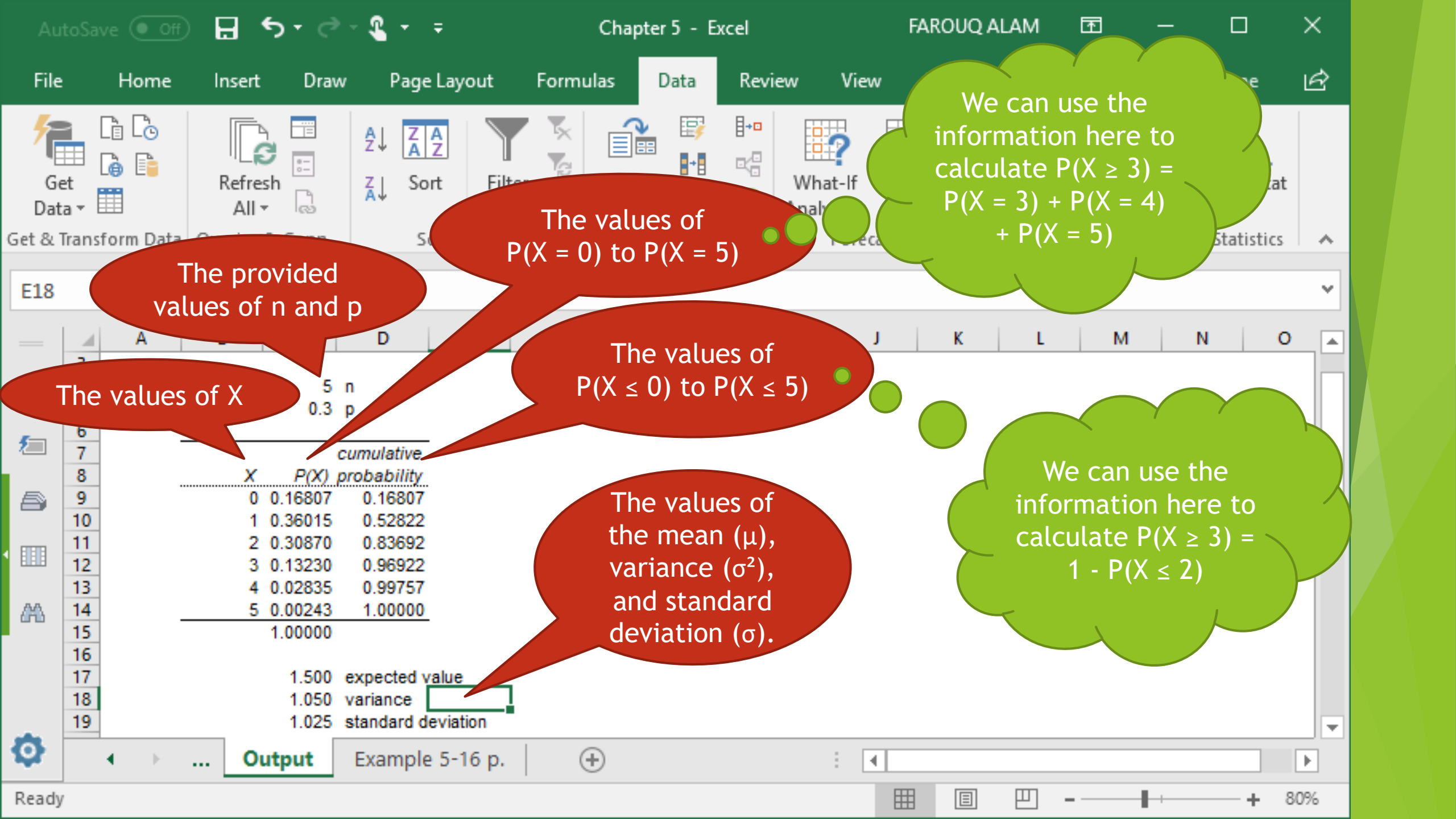
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Get Data
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E18
The provided values of n and p
The values of P(X = 0) to P(X = 5)
We can use the information here to calculate P(X ≥ 3) = P(X = 3) + P(X = 4) + P(X = 5)
The values of X
The values of P(X ≤ 0) to P(X ≤ 5)
We can use the information here to calculate P(X ≥ 3) = 1 - P(X ≤ 2)
The values of the mean (μ), variance (σ²), and standard deviation (σ).
5 n
0.3 p
X P(X) cumulative probability
0 0.16807 0.16807
1 0.36015 0.52822
2 0.30870 0.83692
3 0.13230 0.96922
4 0.02835 0.99757
5 0.00243 1.00000
1.00000
1.500 expected value
1.050 variance
1.025 standard deviation
Output
Example 5-16 p.
Ready
80%