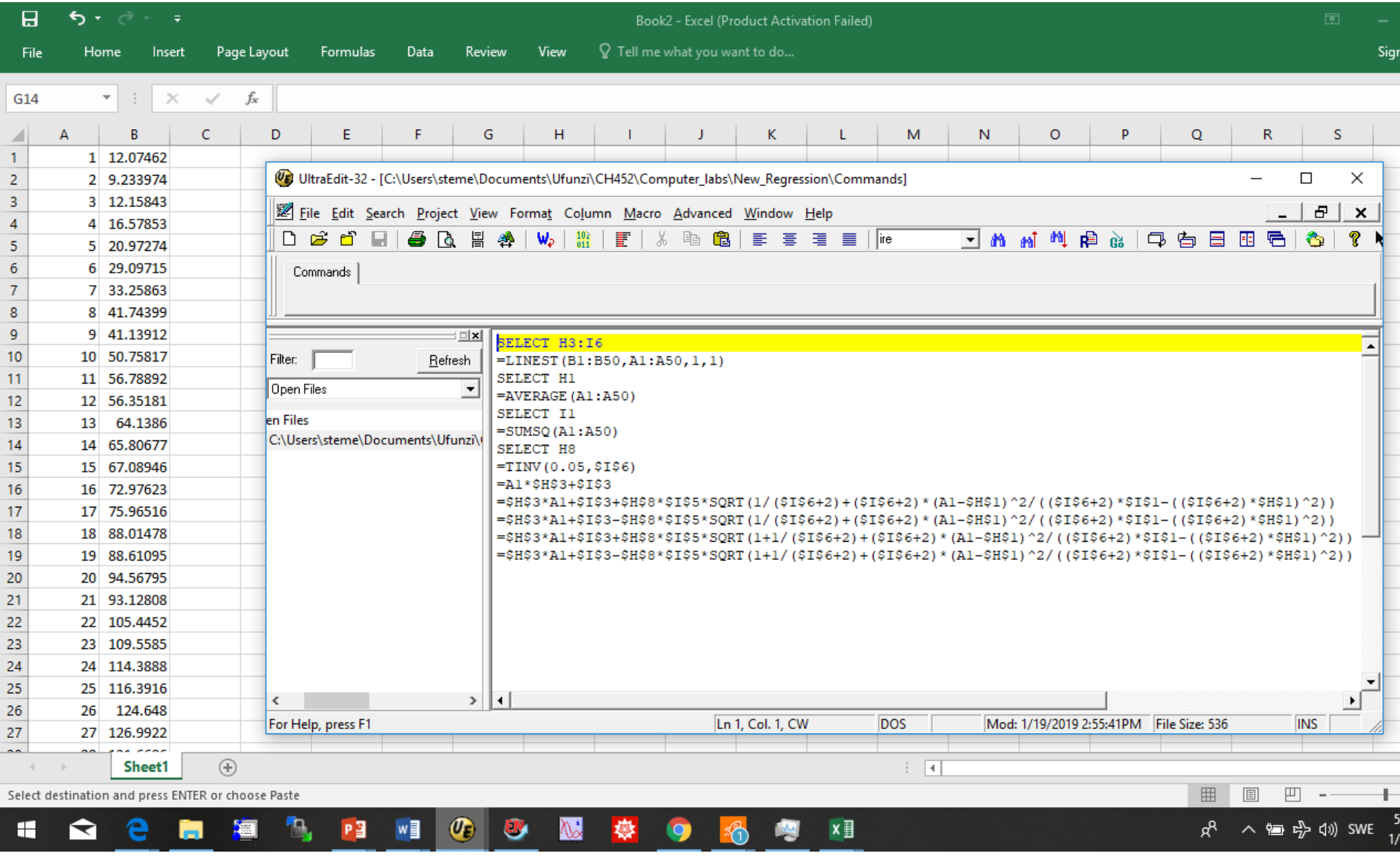
Linear Regression

Worksheet for calculating calibration lines and error analysis

Paste your x,y data into a new spreadsheet
Use the commands shown in the window



SELECT H3:I6
=LINEST(B1:B50,A1:A50,1,1)

SELECT H1
=AVERAGE(A1:A50)

SELECT I1
=SUMSQ(A1:A50)

Make each selection first and then paste the command in black into the spreadsheet header

SELECT H8
=TINV(0.05,$I$6)

SELECT C1
=A1*$H$3+$I$3
THEN CLICK THE LOWER RIGHT CORNER TO FILL THE C COLUMN

These steps are what you did in the computational Lab to perform the linear regression, calculate the t-test and generate the calculated line
The "trumpets" are on the next page

SELECT D1

```
=$H$3*A1+$I$3+$H$8*$I$5*
  SQRT(1/($I$6+2)+($I$6+2)*(A1-$H$1)^2/(($I$6+2)*$I$1-(($I$6+2)*$H$1)^2))
```

THEN CLICK THE LOWER RIGHT CORNER TO FILL THE D COLUMN

SELECT E1

```
=$H$3*A1+$I$3-$H$8*$I$5*
  SQRT(1/($I$6+2)+($I$6+2)*(A1-$H$1)^2/(($I$6+2)*$I$1-(($I$6+2)*$H$1)^2))
```

THEN CLICK THE LOWER RIGHT CORNER TO FILL THE E COLUMN

SELECT F1

```
=$H$3*A1+$I$3+$H$8*$I$5*
 SQRT(1+1/($I$6+2)+($I$6+2)*(A1-$H$1)^2/(($I$6+2)*$I$1-(($I$6+2)*$H$1)^2))
```

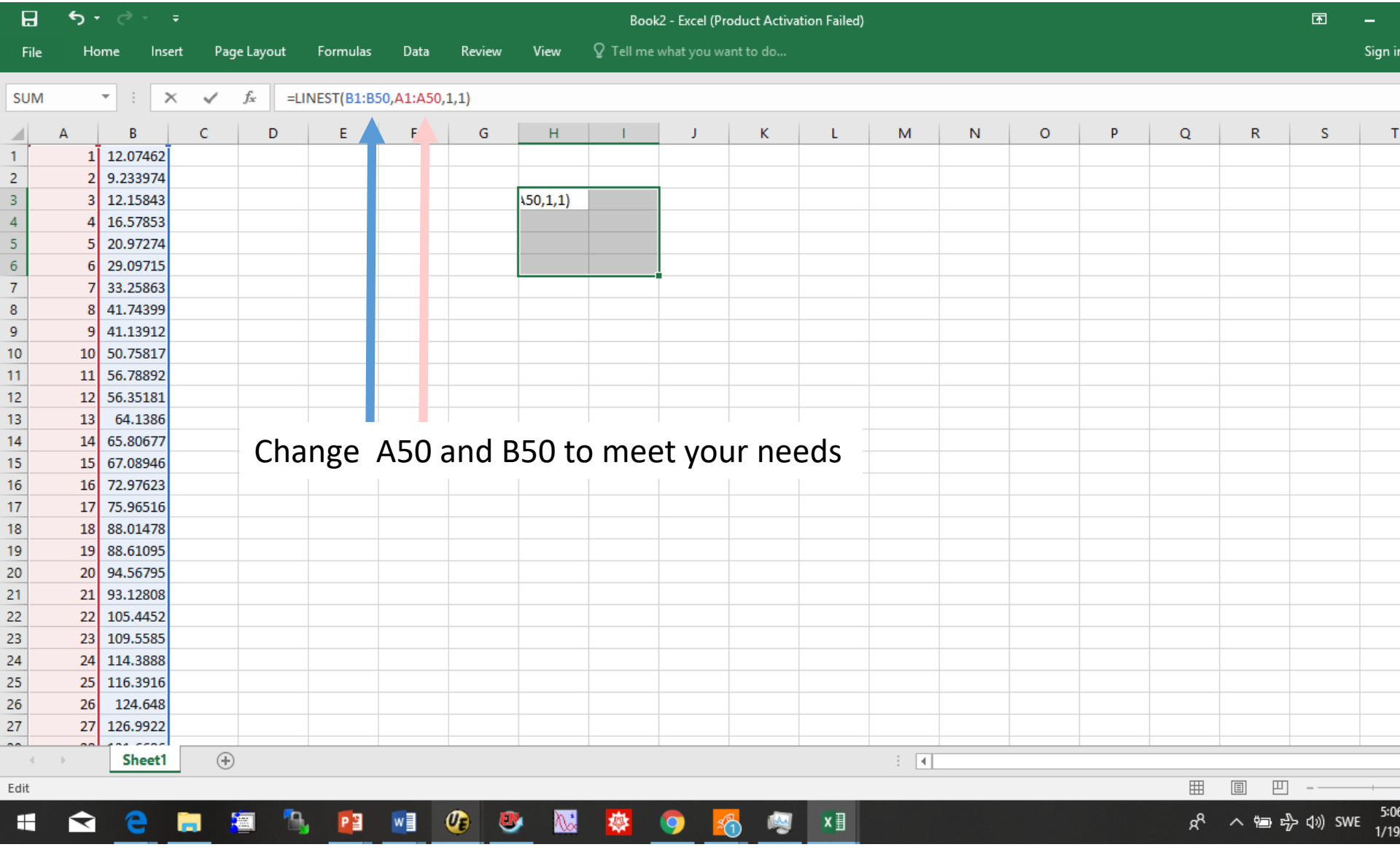
THEN CLICK THE LOWER RIGHT CORNER TO FILL THE F COLUMN

SELECT G1

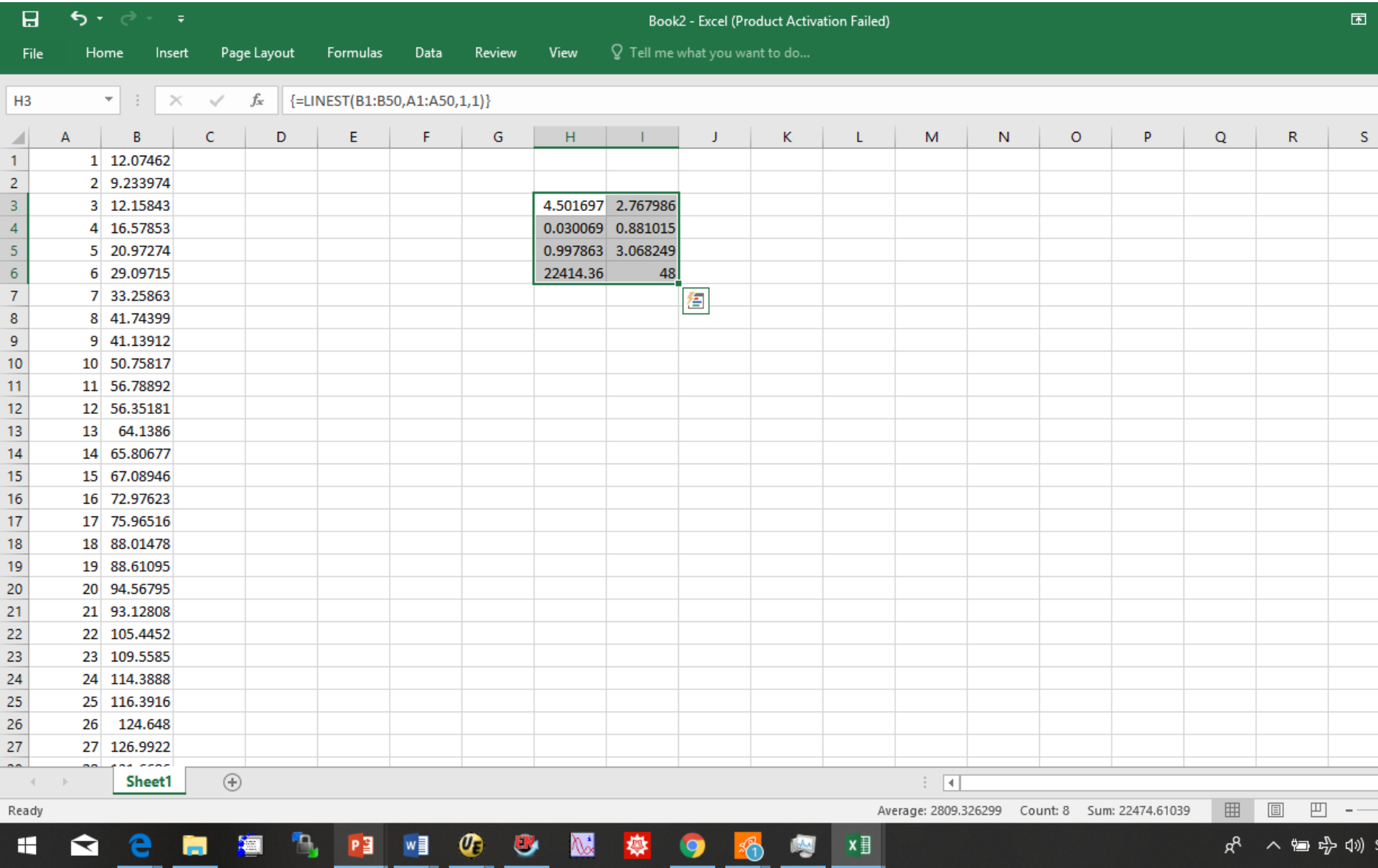
```
=$H$3*A1+$I$3-$H$8*$I$5*S
  QRT(1+1/($I$6+2)+($I$6+2)*(A1-$H$1)^2/(($I$6+2)*$I$1-(($I$6+2)*$H$1)^2))
```

THEN CLICK THE LOWER RIGHT CORNER TO FILL THE G COLUMN

Follow the cell designation H3:I6 exactly
Also specify the number of data points

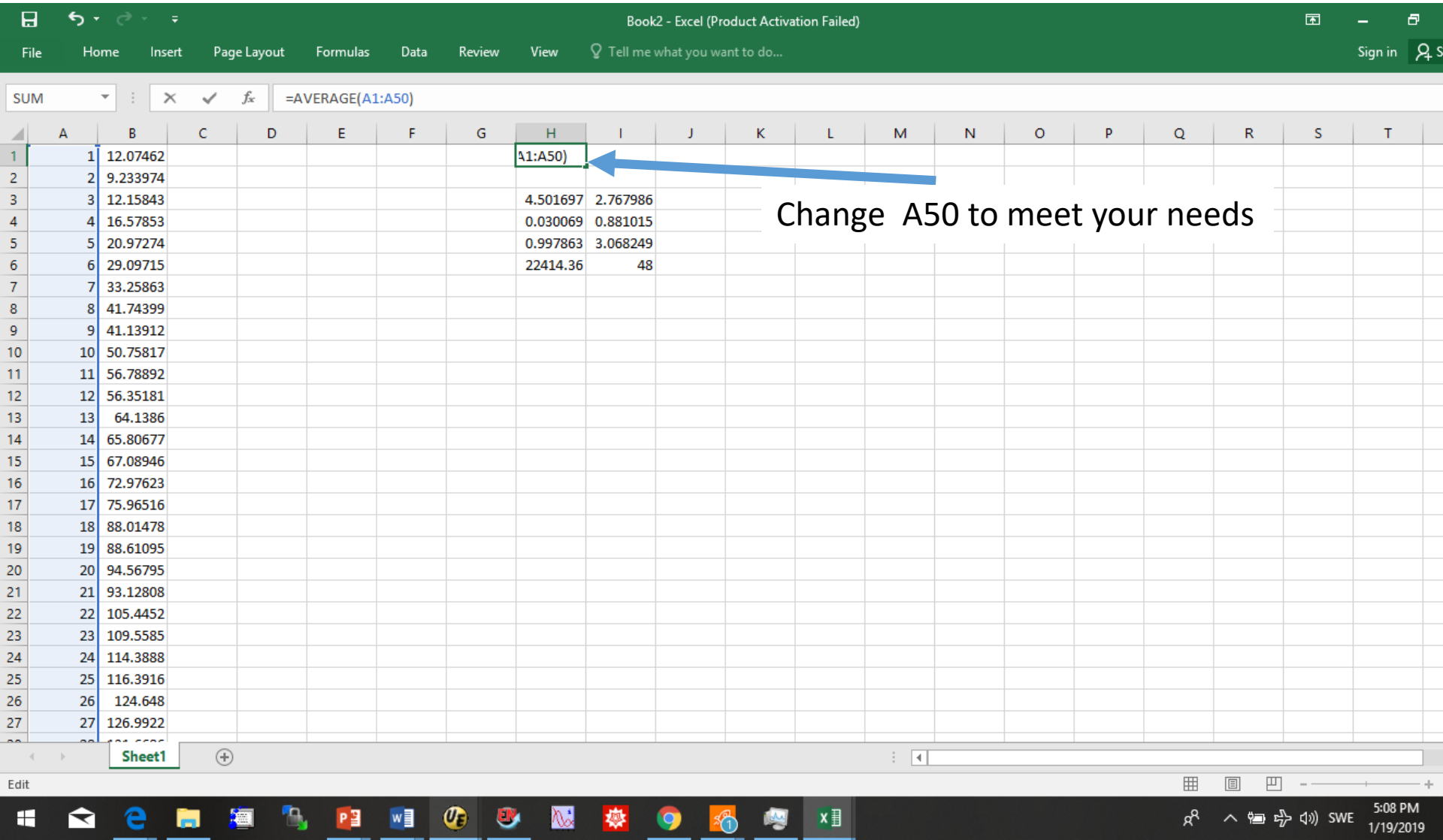


Ctrl-Shift-Enter



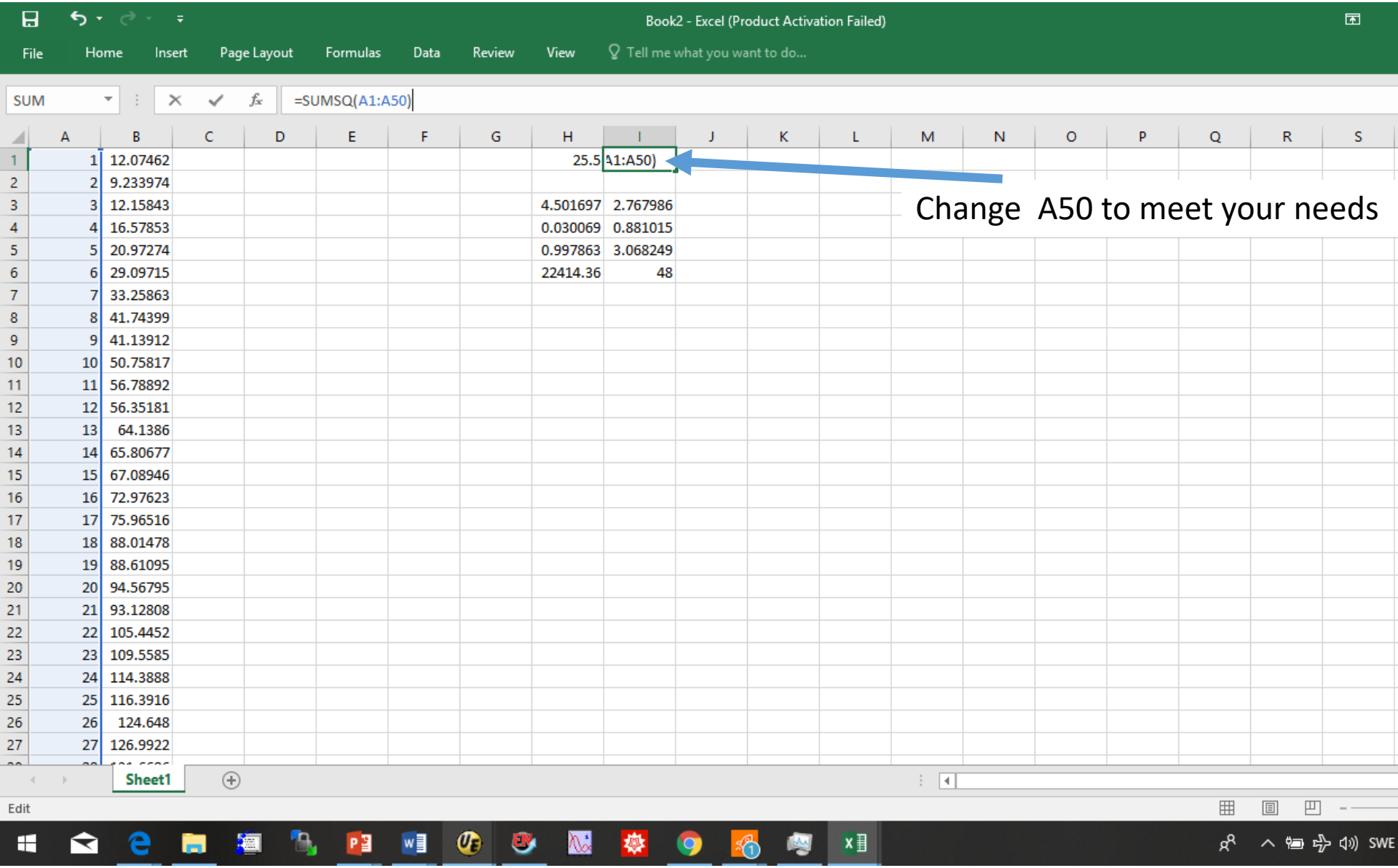
	A	B
1	1	12.07462
2	2	9.233974
3	3	12.15843
4	4	16.57853
5	5	20.97274
6	6	29.09715
7	7	33.25863
8	8	41.74399
9	9	41.13912
10	10	50.75817
11	11	56.78892
12	12	56.35181
13	13	64.1386
14	14	65.80677
15	15	67.08946
16	16	72.97623
17	17	75.96516
18	18	88.01478
19	19	88.61095
20	20	94.56795
21	21	93.12808
22	22	105.4452
23	23	109.5585
24	24	114.3888
25	25	116.3916
26	26	124.648
27	27	126.9922

Put the average of the A column in H1



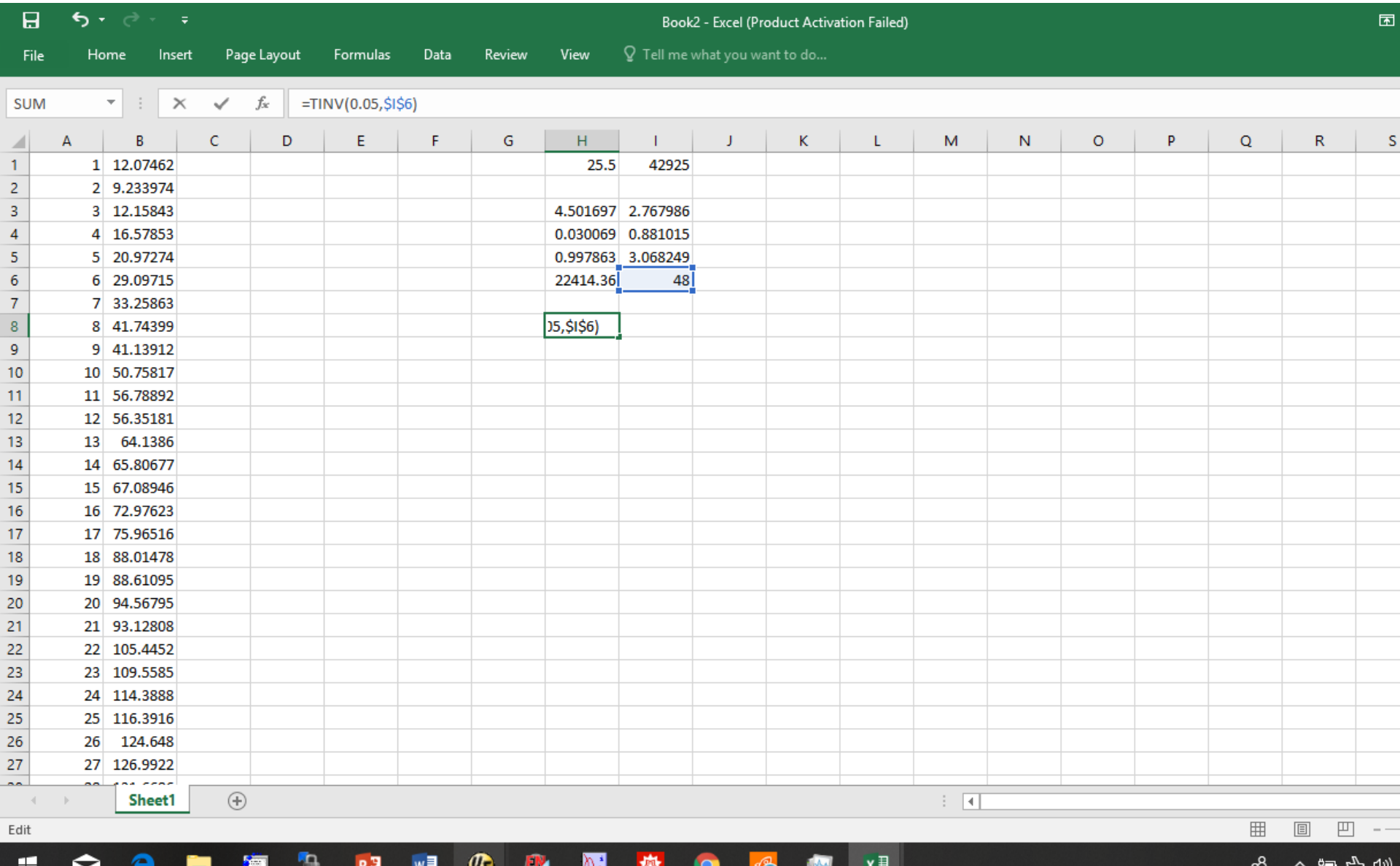
	A	B	H	I
1	1	12.07462	A1:A50)	
2	2	9.233974		
3	3	12.15843	4.501697	2.767986
4	4	16.57853	0.030069	0.881015
5	5	20.97274	0.997863	3.068249
6	6	29.09715	22414.36	48
7	7	33.25863		
8	8	41.74399		
9	9	41.13912		
10	10	50.75817		
11	11	56.78892		
12	12	56.35181		
13	13	64.1386		
14	14	65.80677		
15	15	67.08946		
16	16	72.97623		
17	17	75.96516		
18	18	88.01478		
19	19	88.61095		
20	20	94.56795		
21	21	93.12808		
22	22	105.4452		
23	23	109.5585		
24	24	114.3888		
25	25	116.3916		
26	26	124.648		
27	27	126.9922		

Put the sum of squares of the A column in I1



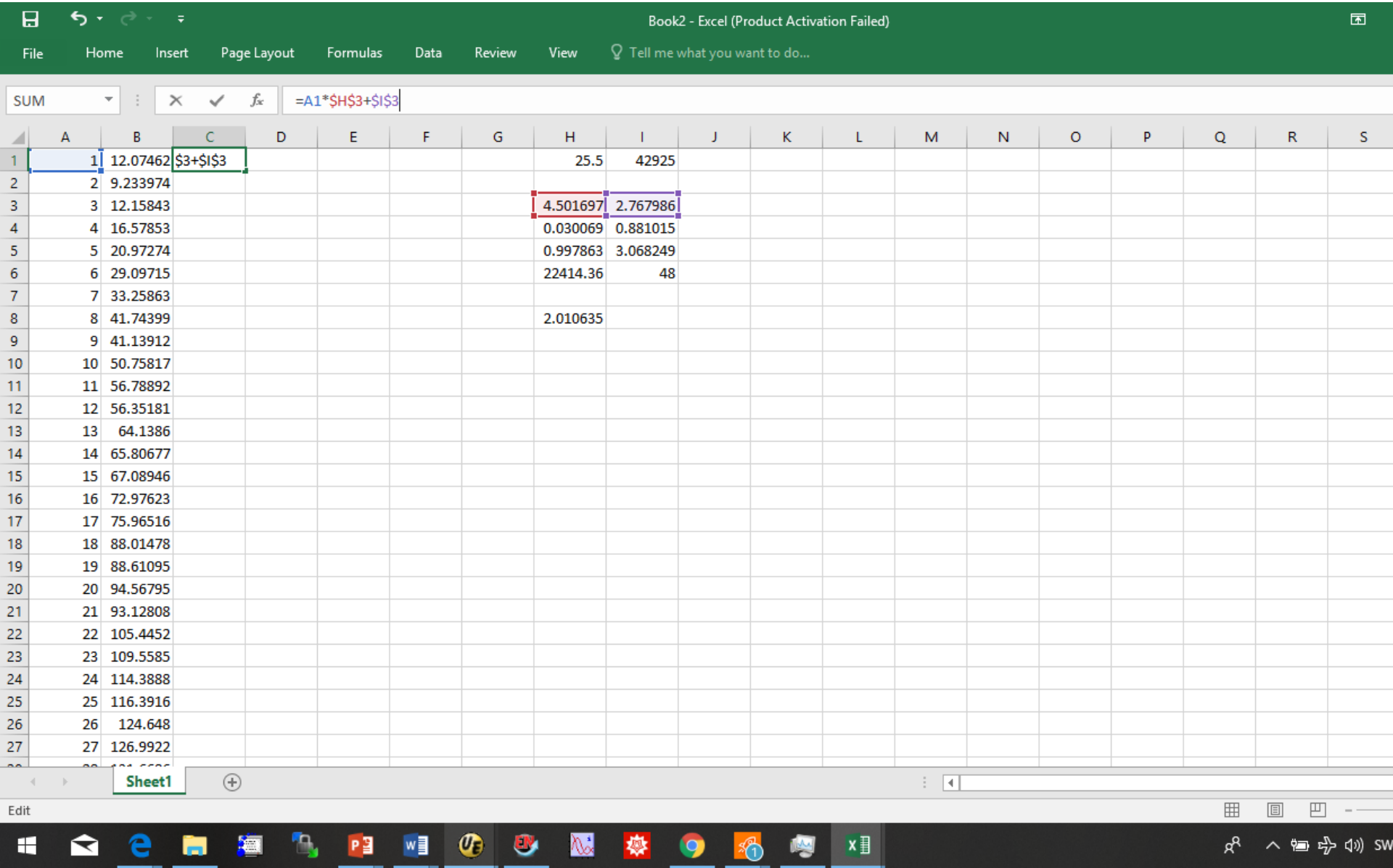
	A	B	H	I
1	1	12.07462	25.5	A1:A50)
2	2	9.233974		
3	3	12.15843	4.501697	2.767986
4	4	16.57853	0.030069	0.881015
5	5	20.97274	0.997863	3.068249
6	6	29.09715	22414.36	48
7	7	33.25863		
8	8	41.74399		
9	9	41.13912		
10	10	50.75817		
11	11	56.78892		
12	12	56.35181		
13	13	64.1386		
14	14	65.80677		
15	15	67.08946		
16	16	72.97623		
17	17	75.96516		
18	18	88.01478		
19	19	88.61095		
20	20	94.56795		
21	21	93.12808		
22	22	105.4452		
23	23	109.5585		
24	24	114.3888		
25	25	116.3916		
26	26	124.648		
27	27	126.9922		

Put t-test value in H8



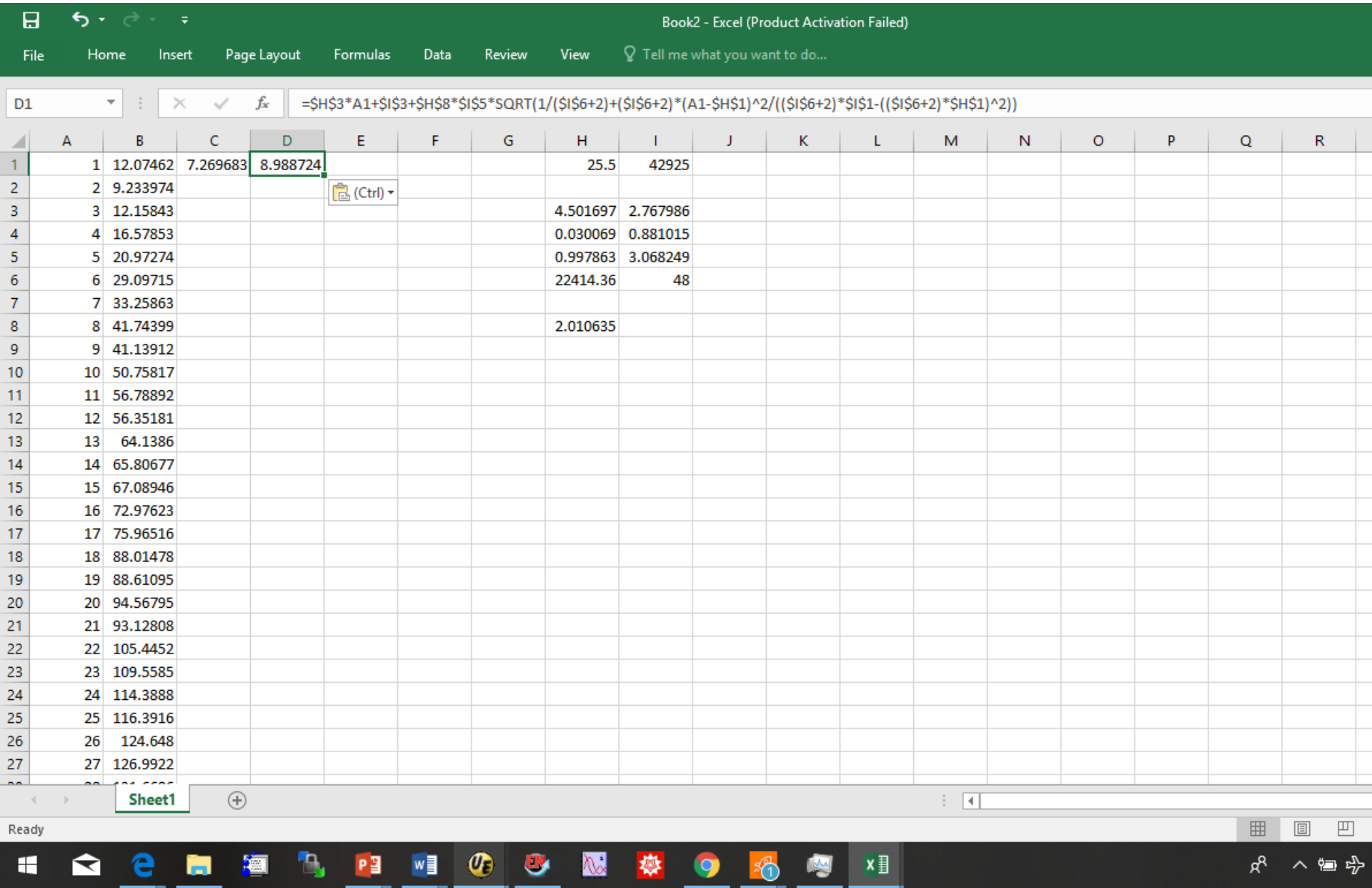
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	1	12.07462						25.5	42925										
2	2	9.233974																	
3	3	12.15843						4.501697	2.767986										
4	4	16.57853						0.030069	0.881015										
5	5	20.97274						0.997863	3.068249										
6	6	29.09715						22414.36	48										
7	7	33.25863																	
8	8	41.74399						)5,$I$6)											
9	9	41.13912																	
10	10	50.75817																	
11	11	56.78892																	
12	12	56.35181																	
13	13	64.1386																	
14	14	65.80677																	
15	15	67.08946																	
16	16	72.97623																	
17	17	75.96516																	
18	18	88.01478																	
19	19	88.61095																	
20	20	94.56795																	
21	21	93.12808																	
22	22	105.4452																	
23	23	109.5585																	
24	24	114.3888																	
25	25	116.3916																	
26	26	124.648																	
27	27	126.9922																	

Place the calculated regression line in C1



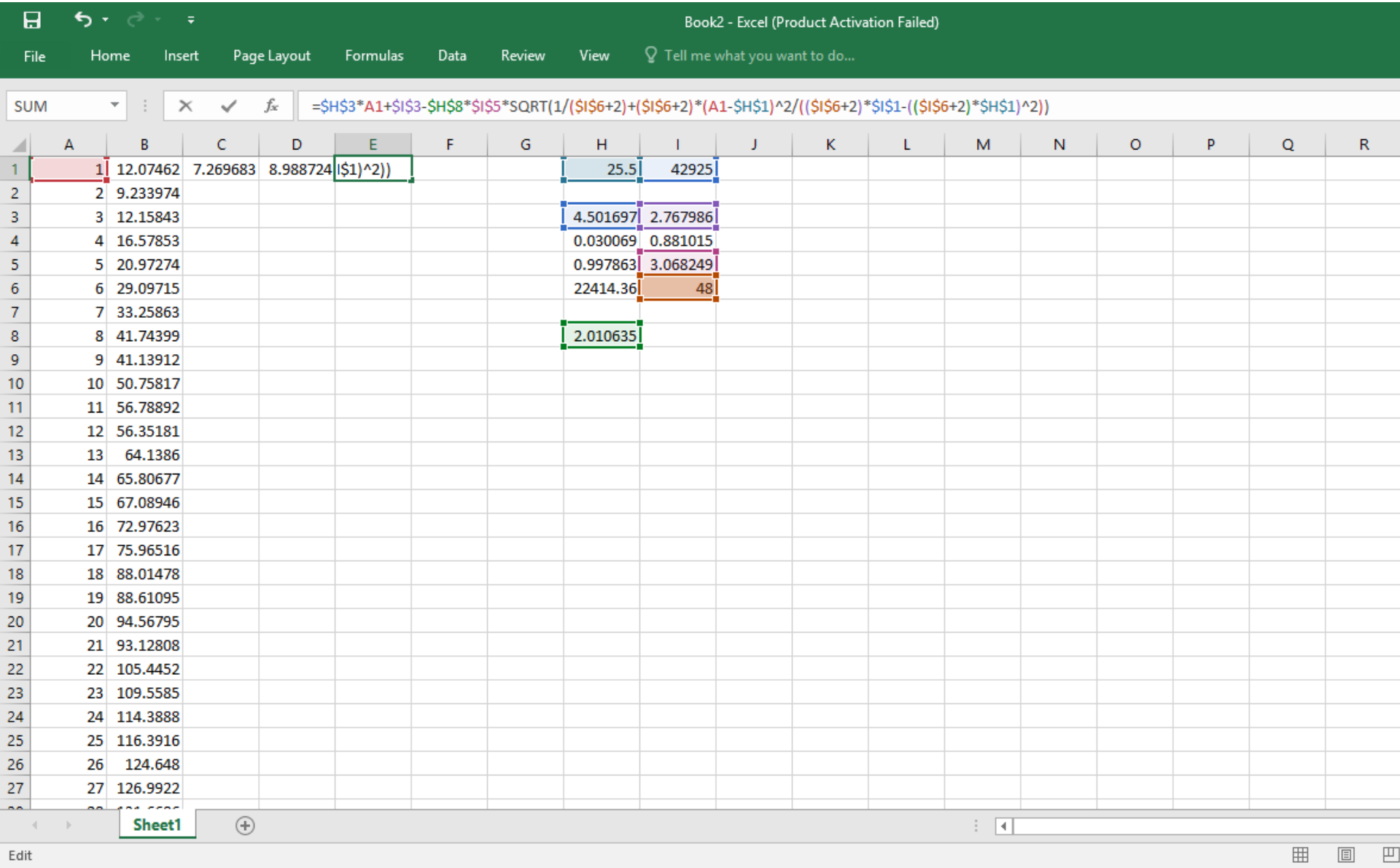
	A	B	C	H	I
1	1	12.07462	$3+$I$3	25.5	42925
2	2	9.233974			
3	3	12.15843		4.501697	2.767986
4	4	16.57853		0.030069	0.881015
5	5	20.97274		0.997863	3.068249
6	6	29.09715		22414.36	48
7	7	33.25863			
8	8	41.74399		2.010635	
9	9	41.13912			
10	10	50.75817			
11	11	56.78892			
12	12	56.35181			
13	13	64.1386			
14	14	65.80677			
15	15	67.08946			
16	16	72.97623			
17	17	75.96516			
18	18	88.01478			
19	19	88.61095			
20	20	94.56795			
21	21	93.12808			
22	22	105.4452			
23	23	109.5585			
24	24	114.3888			
25	25	116.3916			
26	26	124.648			
27	27	126.9922			

Place calculated upper confidence curve in D1



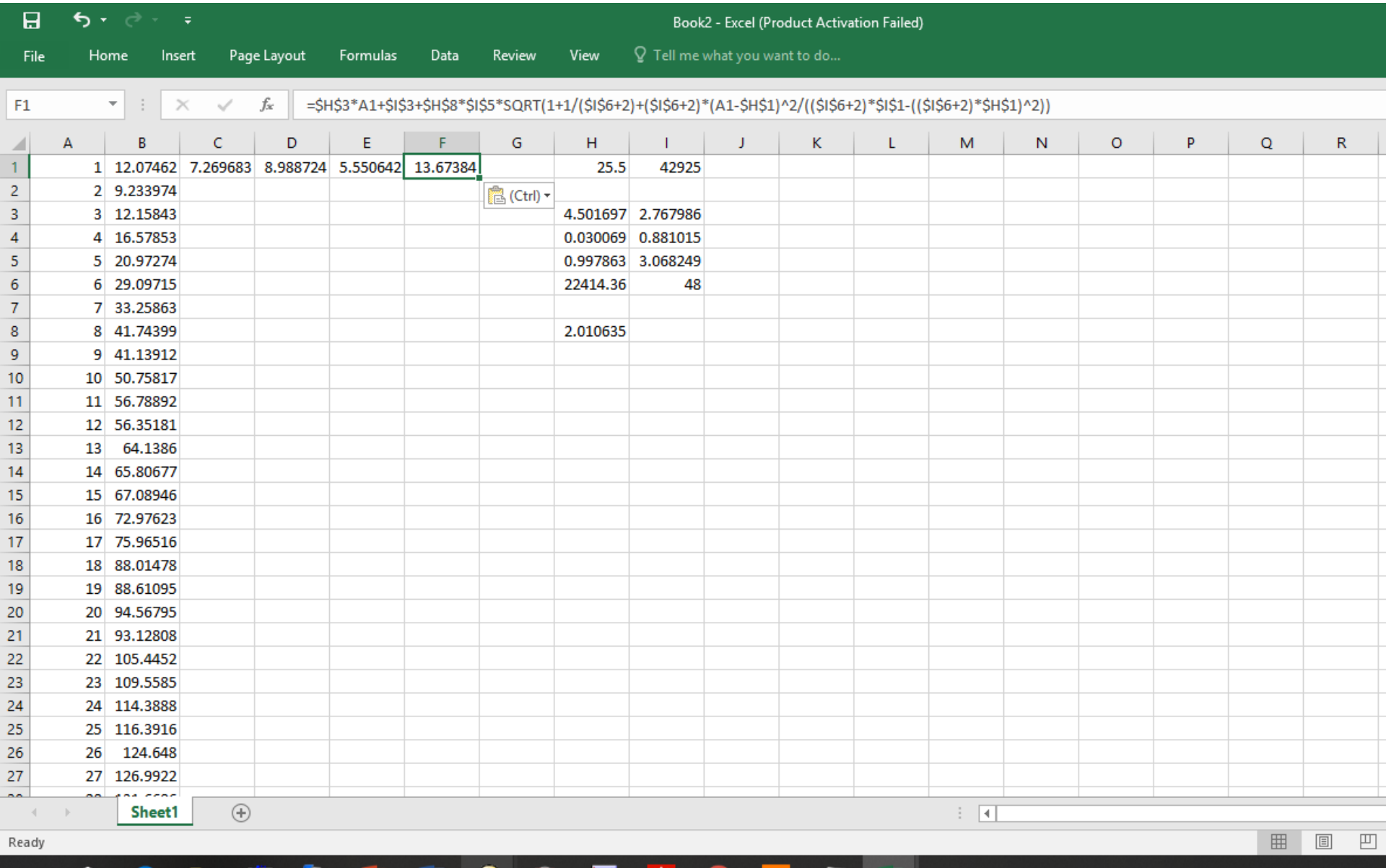
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	1	12.07462	7.269683	8.988724				25.5	42925									
2	2	9.233974																
3	3	12.15843						4.501697	2.767986									
4	4	16.57853						0.030069	0.881015									
5	5	20.97274						0.997863	3.068249									
6	6	29.09715						22414.36	48									
7	7	33.25863																
8	8	41.74399						2.010635										
9	9	41.13912																
10	10	50.75817																
11	11	56.78892																
12	12	56.35181																
13	13	64.1386																
14	14	65.80677																
15	15	67.08946																
16	16	72.97623																
17	17	75.96516																
18	18	88.01478																
19	19	88.61095																
20	20	94.56795																
21	21	93.12808																
22	22	105.4452																
23	23	109.5585																
24	24	114.3888																
25	25	116.3916																
26	26	124.648																
27	27	126.9922																

Place calculated lower confidence curve in E1



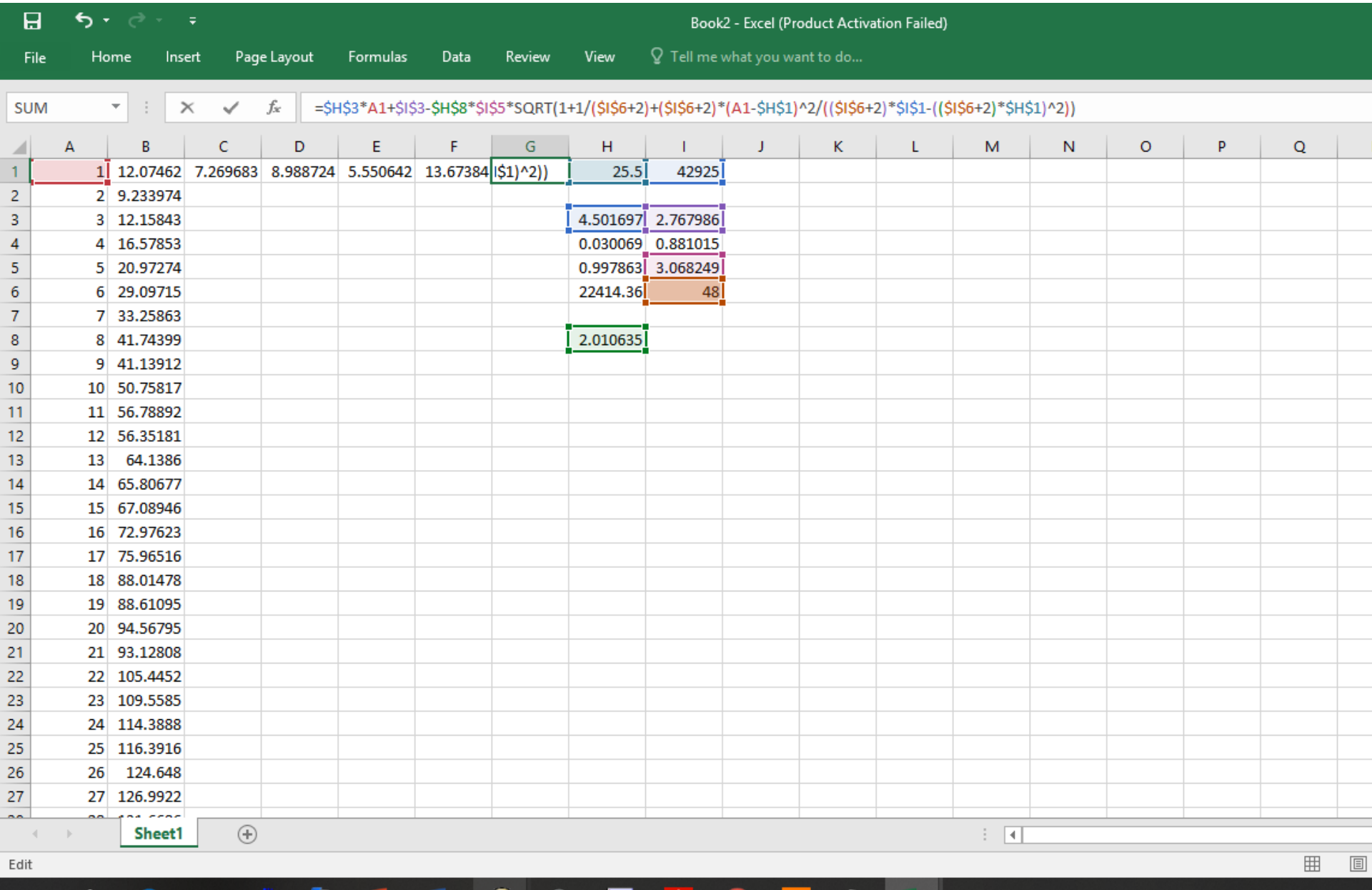
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	1	12.07462	7.269683	8.988724	I$1)^2))			25.5	42925									
2	2	9.233974																
3	3	12.15843						4.501697	2.767986									
4	4	16.57853						0.030069	0.881015									
5	5	20.97274						0.997863	3.068249									
6	6	29.09715						22414.36	48									
7	7	33.25863																
8	8	41.74399						2.010635										
9	9	41.13912																
10	10	50.75817																
11	11	56.78892																
12	12	56.35181																
13	13	64.1386																
14	14	65.80677																
15	15	67.08946																
16	16	72.97623																
17	17	75.96516																
18	18	88.01478																
19	19	88.61095																
20	20	94.56795																
21	21	93.12808																
22	22	105.4452																
23	23	109.5585																
24	24	114.3888																
25	25	116.3916																
26	26	124.648																
27	27	126.9922																

Place calculated upper prediction curve in F1



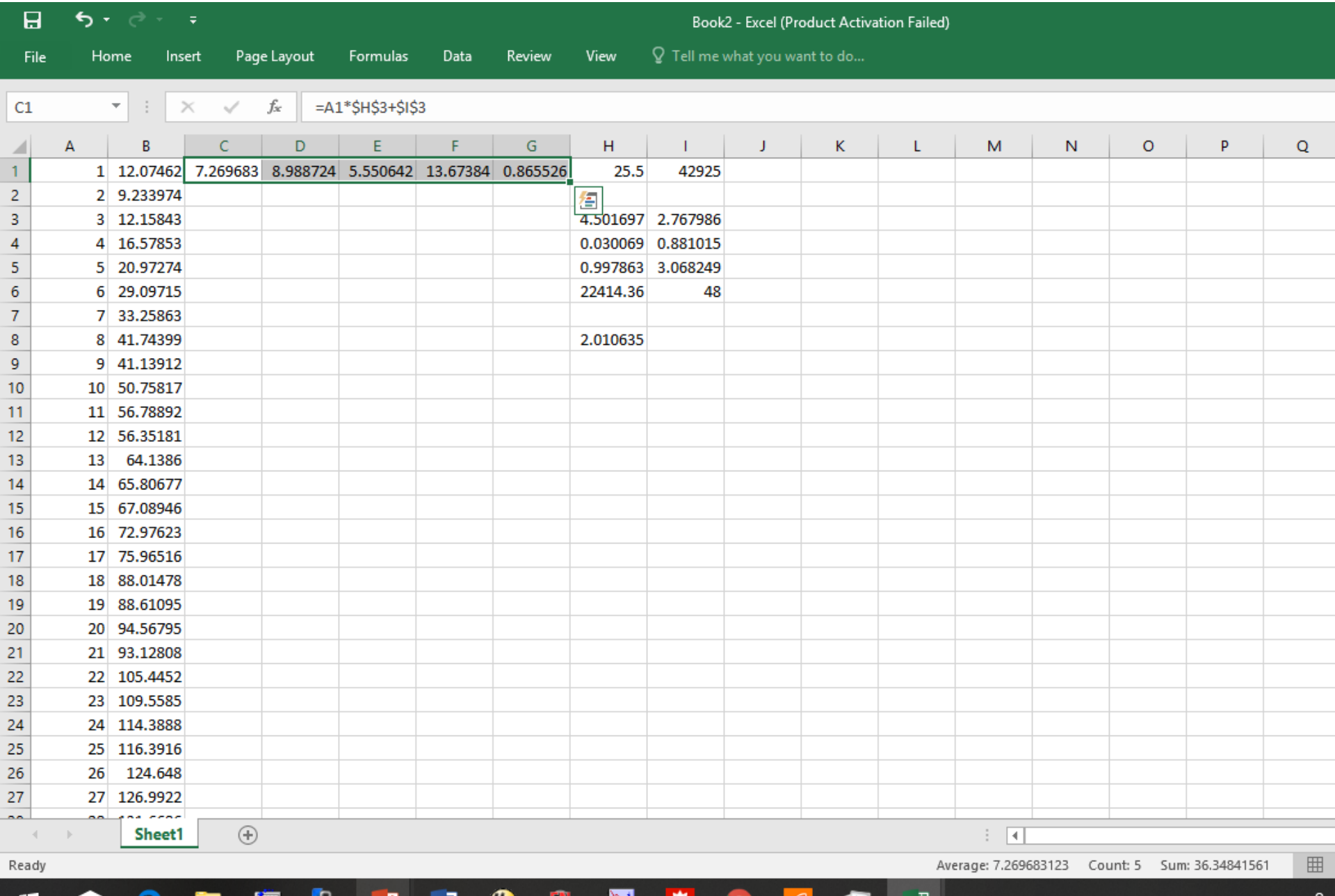
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	1	12.07462	7.269683	8.988724	5.550642	13.67384		25.5	42925									
2	2	9.233974																
3	3	12.15843						4.501697	2.767986									
4	4	16.57853						0.030069	0.881015									
5	5	20.97274						0.997863	3.068249									
6	6	29.09715						22414.36	48									
7	7	33.25863																
8	8	41.74399						2.010635										
9	9	41.13912																
10	10	50.75817																
11	11	56.78892																
12	12	56.35181																
13	13	64.1386																
14	14	65.80677																
15	15	67.08946																
16	16	72.97623																
17	17	75.96516																
18	18	88.01478																
19	19	88.61095																
20	20	94.56795																
21	21	93.12808																
22	22	105.4452																
23	23	109.5585																
24	24	114.3888																
25	25	116.3916																
26	26	124.648																
27	27	126.9922																

Place calculated lower prediction curve in G1



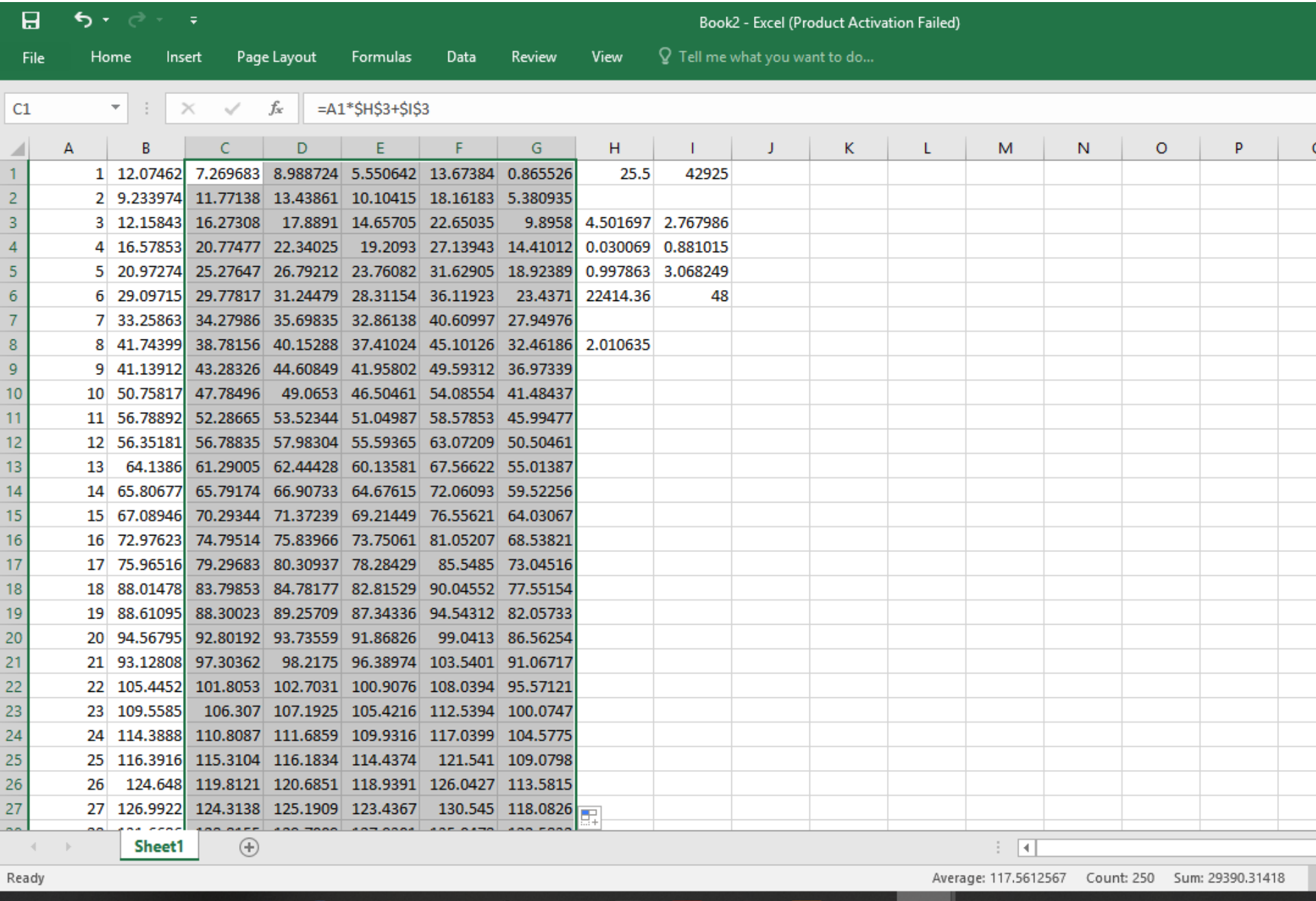
	A	B	C	D	E	F	G	H	I
1	1	12.07462	7.269683	8.988724	5.550642	13.67384	I$1)^2))	25.5	42925
2	2	9.233974							
3	3	12.15843						4.501697	2.767986
4	4	16.57853						0.030069	0.881015
5	5	20.97274						0.997863	3.068249
6	6	29.09715						22414.36	48
7	7	33.25863							
8	8	41.74399						2.010635	
9	9	41.13912							
10	10	50.75817							
11	11	56.78892							
12	12	56.35181							
13	13	64.1386							
14	14	65.80677							
15	15	67.08946							
16	16	72.97623							
17	17	75.96516							
18	18	88.01478							
19	19	88.61095							
20	20	94.56795							
21	21	93.12808							
22	22	105.4452							
23	23	109.5585							
24	24	114.3888							
25	25	116.3916							
26	26	124.648							
27	27	126.9922							

Select C1-G1 and double click lower right corner



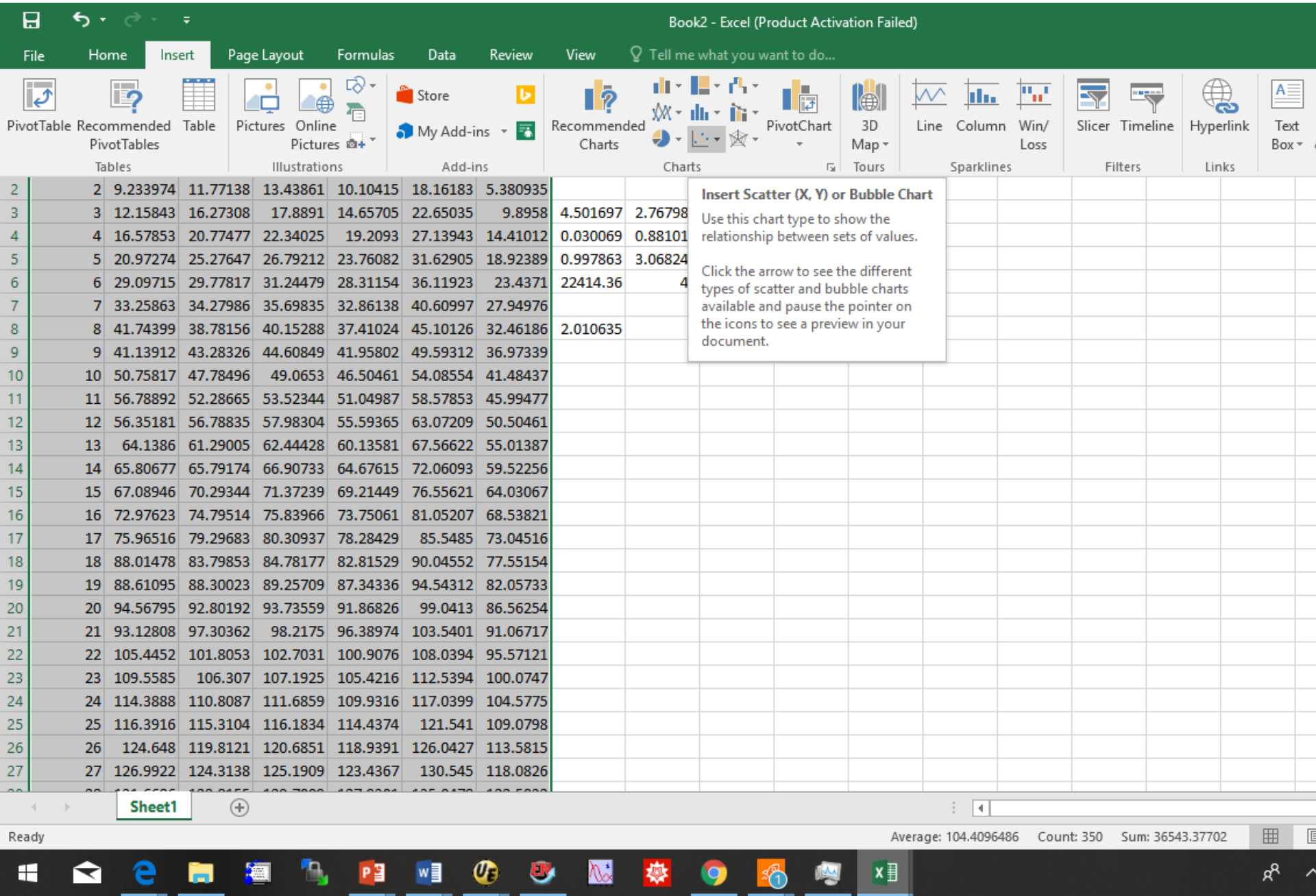
	A	B	C	D	E	F	G	H	I
1	1	12.07462	7.269683	8.988724	5.550642	13.67384	0.865526	25.5	42925
2	2	9.233974							
3	3	12.15843						4.501697	2.767986
4	4	16.57853						0.030069	0.881015
5	5	20.97274						0.997863	3.068249
6	6	29.09715						22414.36	48
7	7	33.25863							
8	8	41.74399						2.010635	
9	9	41.13912							
10	10	50.75817							
11	11	56.78892							
12	12	56.35181							
13	13	64.1386							
14	14	65.80677							
15	15	67.08946							
16	16	72.97623							
17	17	75.96516							
18	18	88.01478							
19	19	88.61095							
20	20	94.56795							
21	21	93.12808							
22	22	105.4452							
23	23	109.5585							
24	24	114.3888							
25	25	116.3916							
26	26	124.648							
27	27	126.9922							

This fills all values down to the bottom of data



	A	B	C	D	E	F	G	H	I
1	1	12.07462	7.269683	8.988724	5.550642	13.67384	0.865526	25.5	42925
2	2	9.233974	11.77138	13.43861	10.10415	18.16183	5.380935		
3	3	12.15843	16.27308	17.8891	14.65705	22.65035	9.8958	4.501697	2.767986
4	4	16.57853	20.77477	22.34025	19.2093	27.13943	14.41012	0.030069	0.881015
5	5	20.97274	25.27647	26.79212	23.76082	31.62905	18.92389	0.997863	3.068249
6	6	29.09715	29.77817	31.24479	28.31154	36.11923	23.4371	22414.36	48
7	7	33.25863	34.27986	35.69835	32.86138	40.60997	27.94976		
8	8	41.74399	38.78156	40.15288	37.41024	45.10126	32.46186	2.010635	
9	9	41.13912	43.28326	44.60849	41.95802	49.59312	36.97339		
10	10	50.75817	47.78496	49.0653	46.50461	54.08554	41.48437		
11	11	56.78892	52.28665	53.52344	51.04987	58.57853	45.99477		
12	12	56.35181	56.78835	57.98304	55.59365	63.07209	50.50461		
13	13	64.1386	61.29005	62.44428	60.13581	67.56622	55.01387		
14	14	65.80677	65.79174	66.90733	64.67615	72.06093	59.52256		
15	15	67.08946	70.29344	71.37239	69.21449	76.55621	64.03067		
16	16	72.97623	74.79514	75.83966	73.75061	81.05207	68.53821		
17	17	75.96516	79.29683	80.30937	78.28429	85.5485	73.04516		
18	18	88.01478	83.79853	84.78177	82.81529	90.04552	77.55154		
19	19	88.61095	88.30023	89.25709	87.34336	94.54312	82.05733		
20	20	94.56795	92.80192	93.73559	91.86826	99.0413	86.56254		
21	21	93.12808	97.30362	98.2175	96.38974	103.5401	91.06717		
22	22	105.4452	101.8053	102.7031	100.9076	108.0394	95.57121		
23	23	109.5585	106.307	107.1925	105.4216	112.5394	100.0747		
24	24	114.3888	110.8087	111.6859	109.9316	117.0399	104.5775		
25	25	116.3916	115.3104	116.1834	114.4374	121.541	109.0798		
26	26	124.648	119.8121	120.6851	118.9391	126.0427	113.5815		
27	27	126.9922	124.3138	125.1909	123.4367	130.545	118.0826		

Make a scatter plot



2	2	9.233974	11.77138	13.43861	10.10415	18.16183	5.380935		
3	3	12.15843	16.27308	17.8891	14.65705	22.65035	9.8958	4.501697	2.76798
4	4	16.57853	20.77477	22.34025	19.2093	27.13943	14.41012	0.030069	0.88101
5	5	20.97274	25.27647	26.79212	23.76082	31.62905	18.92389	0.997863	3.06824
6	6	29.09715	29.77817	31.24479	28.31154	36.11923	23.4371	22414.36	4
7	7	33.25863	34.27986	35.69835	32.86138	40.60997	27.94976		
8	8	41.74399	38.78156	40.15288	37.41024	45.10126	32.46186	2.010635	
9	9	41.13912	43.28326	44.60849	41.95802	49.59312	36.97339		
10	10	50.75817	47.78496	49.0653	46.50461	54.08554	41.48437		
11	11	56.78892	52.28665	53.52344	51.04987	58.57853	45.99477		
12	12	56.35181	56.78835	57.98304	55.59365	63.07209	50.50461		
13	13	64.1386	61.29005	62.44428	60.13581	67.56622	55.01387		
14	14	65.80677	65.79174	66.90733	64.67615	72.06093	59.52256		
15	15	67.08946	70.29344	71.37239	69.21449	76.55621	64.03067		
16	16	72.97623	74.79514	75.83966	73.75061	81.05207	68.53821		
17	17	75.96516	79.29683	80.30937	78.28429	85.5485	73.04516		
18	18	88.01478	83.79853	84.78177	82.81529	90.04552	77.55154		
19	19	88.61095	88.30023	89.25709	87.34336	94.54312	82.05733		
20	20	94.56795	92.80192	93.73559	91.86826	99.0413	86.56254		
21	21	93.12808	97.30362	98.2175	96.38974	103.5401	91.06717		
22	22	105.4452	101.8053	102.7031	100.9076	108.0394	95.57121		
23	23	109.5585	106.307	107.1925	105.4216	112.5394	100.0747		
24	24	114.3888	110.8087	111.6859	109.9316	117.0399	104.5775		
25	25	116.3916	115.3104	116.1834	114.4374	121.541	109.0798		
26	26	124.648	119.8121	120.6851	118.9391	126.0427	113.5815		
27	27	126.9922	124.3138	125.1909	123.4367	130.545	118.0826		

Done

Book2 - Excel (Product Activation Failed)

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Formula Bar

	A	B	C	D	E	F	G	H	I
1	1	12.07462	7.269683	8.988724	5.550642	13.67384	0.865526	25.5	42925
2	2	9.233974	11.77138	13.43861	10.10415	18.16183	5.380935		
3	3	12.15843	16.27308	17.8891	14.65705	22.65035	9.8958	4.501697	2.767986
4	4	16.57853	20.77477	22.34025	19.2093	27.13943	14.41012	0.030069	0.881015
5	5	20.97274	25.27647	26.79212	23.76082	31.62905	18.92389	0.997863	3.068249
6	6	29.09715	29.77817	31.24479	28.31154	36.11923	23.4371	22414.36	48
7	7	33.25863	34.27986	35.69835	32.86138	40.60997	27.94976		
8	8	41.74399	38.78156	40.15288	37.41024	45.10126	32.46186	2.010635	
9	9	41.13912	43.28326	44.60849	41.95802	49.59312	36.97339		
10	10	50.75817	47.78496	49.0653	46.50461	54.08554	41.48437		
11	11	56.78892	52.28665	53.52344	51.04987	58.57853	45.99477		
12	12	56.35181	56.78835	57.98304	55.59365	63.07209	50.50461		
13	13	64.1386	61.29005	62.44428	60.13581	67.56622	55.01387		
14	14	65.80677	65.79174	66.90733	64.67615	72.06093	59.52256		
15	15	67.08946	70.29344	71.37239	69.21449	76.55621	64.03067		
16	16	72.97623	74.79514	75.83966	73.75061	81.05207	68.53821		
17	17	75.96516	79.29683	80.30937	78.28429	85.5485	73.04516		
18	18	88.01478	83.79853	84.78177	82.81529	90.04552	77.55154		
19	19	88.61095	88.30023	89.25709	87.34336	94.54312	82.05733		
20	20	94.56795	92.80192	93.73559	91.86826	99.0413	86.56254		
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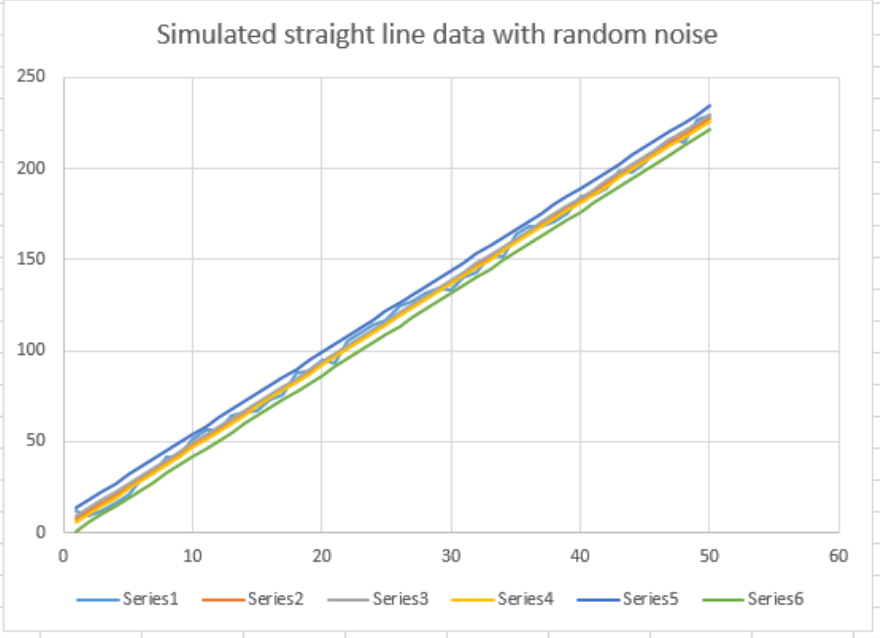
23	23	109.5585	106.307	107.1925	105.4216	112.5394	100.0747		
24	24	114.3888	110.8087	111.6859	109.9316	117.0399	104.5775		
25	25	116.3916	115.3104	116.1834	114.4374	121.541	109.0798		
26	26	124.648	119.8121	120.6851	118.9391	126.0427	113.5815		
27	27	126.9922	124.3138	125.1909	123.4367	130.545	118.0826		



Sheet1

Ready