Problem:

A potential investor wants to purchase shares of stocks in one of two companies A and B which show greater variability in prices. Following is the some prices (in Taka) of the share of the company:

Share price of company A	315	320	350	340	360	365	355	370	372	378	410	390
Share price of company B	1542	1522	1534	1532	1545	1530	1536	1530	1535	1550	1544	1538

Soln:

Company A			Company B		
x (price)	$d = x - A$	d^2	y (price)	$d = y - A$	d^2
315	-50	2500	1542	6	36
320	-45	2025	1522	-14	196
350	-15	225	1534	-2	4
340	-25	625	1532	-4	16
360	-5	25	1545	9	81
(365) A	0	0	1530	-6	36
355	-10	100	(1536) A	0	0
370	5	25	1530	-6	36
372	7	49	1535	-1	1
378	13	169	1550	14	196
410	45	2025	1544	8	64
390	25	625	1538	2	4
	$\Sigma d = -55$	$\Sigma d^2 = 8393$		$\Sigma d = 6$	$\Sigma d^2 = 670$

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First we have to find out the co-efficient of Variances of the two co's prices of share.

Company A

We know,

$$C.V = \frac{\sigma}{\bar{x}} \times 100$$

$$\sigma = \sqrt{\frac{\Sigma d^2}{N} - \left(\frac{\Sigma d}{N}\right)^2}$$

$$= \sqrt{\frac{8393}{12} - \left(\frac{-55}{12}\right)^2}$$

$$= \sqrt{699.42 - (-4.58)^2}$$

$$= \sqrt{678.44} = 26.05$$

$$\bar{x} = A + \frac{\Sigma d}{N}$$

$$= 365 + \frac{-55}{12}$$

$$= 365 - 4.58$$

$$= 360.42$$

$$\therefore CV_x = \frac{26.05}{360.42} \times 100$$

$$= 7.23\%$$

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For company B.

$$C.V = \frac{6}{\bar{y}} \times 100$$

$$\sigma = \sqrt{\frac{\Sigma d^2}{N} - \left(\frac{\Sigma d}{N}\right)^2}$$

$$= \sqrt{\frac{670}{12} - \left(\frac{6}{12}\right)^2}$$

$$= \sqrt{55.83 - 0.25}$$

$$= \sqrt{55.58} = 7.46$$

$$\bar{y} = A + \frac{\Sigma d}{N}$$

$$= 1536 + \frac{6}{12}$$

$$= 1536 + 0.5$$

$$= 1536.5$$

$$CV_y = \frac{7.46}{1536.5} \times 100$$

$$= 0.49\%$$

Comments: From our calculation we find that the prices of shares of company A shows the greater variability.

$CV_x = 7.23\% > CV_y = 0.49\%$

So the investor should purchagese the shares of company B.

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Problem: Following are the marks obtained by two students in 10 tests of 100 marks each:

Test no	1	2	3	4	5	6	7	8	9	10
Marks obtained by A:	44	80	76	48	52	72	68	56	60	54
Marks obtained by B:	48	75	54	60	63	69	72	51	57	66

Soln: Let the marks obtained by A and B denoted by x and y respectively.

Computation of coefficient of variation

Marks obtained by A			Marks obtained by B		
x	$d=x-A$	d^2	y	$d=y-A$	d^2
44	-8	64	48	-21	441
80	28	784	75	6	36
76	24	576	54	-15	225
48	-4	16	60	-9	81
(52) A	0	0	63	-6	36
72	20	400	(69) A	0	0
68	16	256	72	3	9
56	4	16	51	-18	324
60	8	64	57	-12	144
54	2	4	66	-3	9
$\Sigma x = 610$	$\Sigma d = 90$	$\Sigma d^2 = 2180$	$\Sigma y = 615$	$\Sigma d = -75$	$\Sigma d^2 = 1305$

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We know,

$$C.V = \frac{\sigma}{\bar{x}} \times 100$$

For student A,

$$\sigma_x = \sqrt{\frac{\Sigma d^2}{N} - \left(\frac{\Sigma d}{N}\right)^2}$$

$$= \sqrt{\frac{2180}{10} - \left(\frac{90}{10}\right)^2}$$

$$= \sqrt{218 - (9)^2}$$

$$= \sqrt{218 - 81}$$

$$= \sqrt{137} = 11.70$$

and, $\bar{x} = \frac{\Sigma x}{N}$

$$= \frac{610}{10}$$

$$= 61$$

$$C.V_x = \frac{11.70}{61} \times 100$$

$$= 19.18\%$$

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Again, for Student B:

$$\sigma_y = \sqrt{\frac{\Sigma d^2}{N} - \left(\frac{\Sigma d}{N}\right)^2}$$

$$= \sqrt{\frac{1305}{10} - \left(-\frac{75}{10}\right)^2}$$

$$= \sqrt{130.3 - (-7.5)^2}$$

$$= \sqrt{130.5 - 56.25}$$

$$= \sqrt{74.25}$$

$$= 8.62$$

and $\bar{y} = \frac{\Sigma y}{N} = \frac{615}{10}$

$$= 61.5$$

$$CV_y = \frac{8.62}{61.5} \times 100$$

$$= 14.02\%.$$

Since $CV_y < CV_x$, it means Student 'B' is more consistent than Student 'A', therefore 'B' should get the prize.

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Problem: The scores of two cricket players for 10 innings are given below. Compare the efficiency of two players

Cricketer A	101	40	0	13	67	78	6	90	0	3
Cricketer B	20	25	44	35	43	65	55	39	47	27

Soln: Let, Cricketer - A = x

Cricketer - B = y

Cricketer - A			Cricketer - B		
x	$d = x - A$	d^2	y	$d = y - A$	d^2
101	23	529	20	-45	2025
40	-38	1444	25	-40	1600
0	-78	6084	44	-21	441
13	-65	4225	35	-30	900
67	-11	121	43	-22	484
(78)	0	0	65 = A	0	0
6	-72	5184	55	-10	100
90	12	144	39	-26	676
0	-78	6084	47	-18	324
3	-75	5625	27	-38	1444
$\Sigma x = 398$	$\Sigma d = -382$	$\Sigma d^2 = 29440$	$\Sigma y = 400$	$\Sigma d = -250$	$\Sigma d^2 = 7994$

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e know.

$$CV_x = \frac{\sigma_x}{\bar{x}} \times 100$$

$$\sigma_x = \sqrt{\frac{\Sigma d^2}{N} - \left(\frac{\Sigma d}{N}\right)^2}$$

$$= \sqrt{\frac{2944}{10} - \left(\frac{-382}{10}\right)^2}$$

$$= \sqrt{2944 - (-38.2)^2}$$

$$= 38.53$$

$$\text{Mean} = \frac{\Sigma x}{N}$$

$$= \frac{398}{10} = 39.8$$

$$CV_x = \frac{38.53}{39.8} \times 100$$

$$= 96.81\%$$

Now $CV_y = \frac{\sigma_y}{\bar{y}} \times 100$

$$\sigma_y = \sqrt{\frac{\Sigma d^2}{N} - \left(\frac{\Sigma d}{N}\right)^2}$$

$$= \sqrt{\frac{7994}{10} - \left(-\frac{250}{100}\right)^2}$$

$$= 13.20$$

$$\bar{y} = \frac{\Sigma y}{N} = \frac{400}{10} = 40$$

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$$\therefore CV_y = \frac{28.16}{40} \times 100$$

$$= 70.41\%$$

Comment: Here $CV_x = 96.81\%$ and $CV_y = 70.41\%$

$\because CV_y < CV_x$, therefore Cricketer B is more efficient than Cricketer A.

H.W The demand of a commodity in two different towns are given below:

Town-A	36	42	18	35	48	62
Town-B	38	28	25	42	37	40

In which town the condition is more stable and why?

Ans: $CV_x = 33.36\%$

$CV_y = 17.91\%$

$CV_y < CV_x$, so B is more stable

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Problem:

A factory produces two types of lamps. In an experiment on the working life of these lamps in the following

Length of life (hours)	No. of companies	
	Type A	Type B
500-700	5	4
700-900	11	30
900-1100	26	12
1100-1300	10	8
1300-1500	8	6

Which lamp is more consistent?

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Length of life (hrs)	Mid-Value x_i	$d=\frac{x-A}{c}$	Lamp-A			Lamp-B		
			f	fd	fd^2	f	fd	fd^2
500-700	600	-2	5	-10	20	4	-8	16
700-900	800	-1	11	-11	11	30	-30	30
900-1100	1000 A	0	26	0	0	12	0	0
1100-1300	1200	1	10	10	10	8	8	8
1300-1500	1400	2	8	16	32	6	12	24
			N=60	$\Sigma fd=5$	$\Sigma fd^2=73$	N=60	$\Sigma fd=-18$	$\Sigma fd^2=78$

Computation of CV of A:

$$C.V = \frac{\sigma}{\bar{x}} \times 100$$

Here $$\sigma = \sqrt{\frac{\Sigma fd^2}{N} - \left(\frac{\Sigma fd}{N}\right)^2} \times c$$

$$= \sqrt{\frac{73}{60} - \left(\frac{5}{60}\right)^2} \times 200$$

$$= \sqrt{1.22 - 0.01} \times 200$$

$$= 220$$

And $$\bar{x} = A + \frac{\Sigma fd}{N} \times c$$

$$= 100 + \frac{5}{60} \times 200$$

$$= 1016.67$$

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$$CV_A = \frac{220}{1016.67} \times 100$$

$$= 21.64\%$$

Computation of CV of B

$$C.V = \frac{6}{\bar{x}} \times 100$$

Here $$\sigma = \sqrt{\frac{\Sigma fd^2}{N} - \left(\frac{\Sigma fd}{N}\right)^2} \times c$$

$$= \sqrt{\frac{78}{60} - \left(\frac{-18}{60}\right)^2} \times 200.$$

$$= 220$$

and $$\bar{x} = A + \frac{\Sigma fd}{N} \times c$$

$$= 1000 + \frac{-18}{60} \times 200$$

$$= 940$$

$$CV_B = \frac{220}{940} \times 100$$

$$= 23.40\%$$

Comments: $C.V_A = 21.64\%$ and

$CV_B = 23.40\%$.

Here $CV_A < CV_B$.

The lamps of Company A is more consistent.

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