

## PRACTICAL – 10

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**AIM:** To calculate trend using spencer's 15-point formula.

### **EXPERIMENT:**

Following data gives India wheat Production in metric ton from 1989 to 2019. Using Spencer's 15 point formula compute trend value. Also plot the trend line.

23832	26410	24735	21778	24104	28846	29010	31749	35508	31830
25510	24333	29709	36543	45218	22432	32146	44452	26111	50675
36313	37552	42794	45476	44069	47052	44333	46169	54110	49850

### **THEORY:**

1. Spencer's 15-point formula requires 15 points to calculate one single trend value.
2.  $y = 1/320 [4]^2[5][-9,22,-9]yt$ , is the formula which is correct up to 3rd differences.
3. For higher differences, we can add factors involving higher differences without affecting the accuracy of the results. Hence the formula for this is:

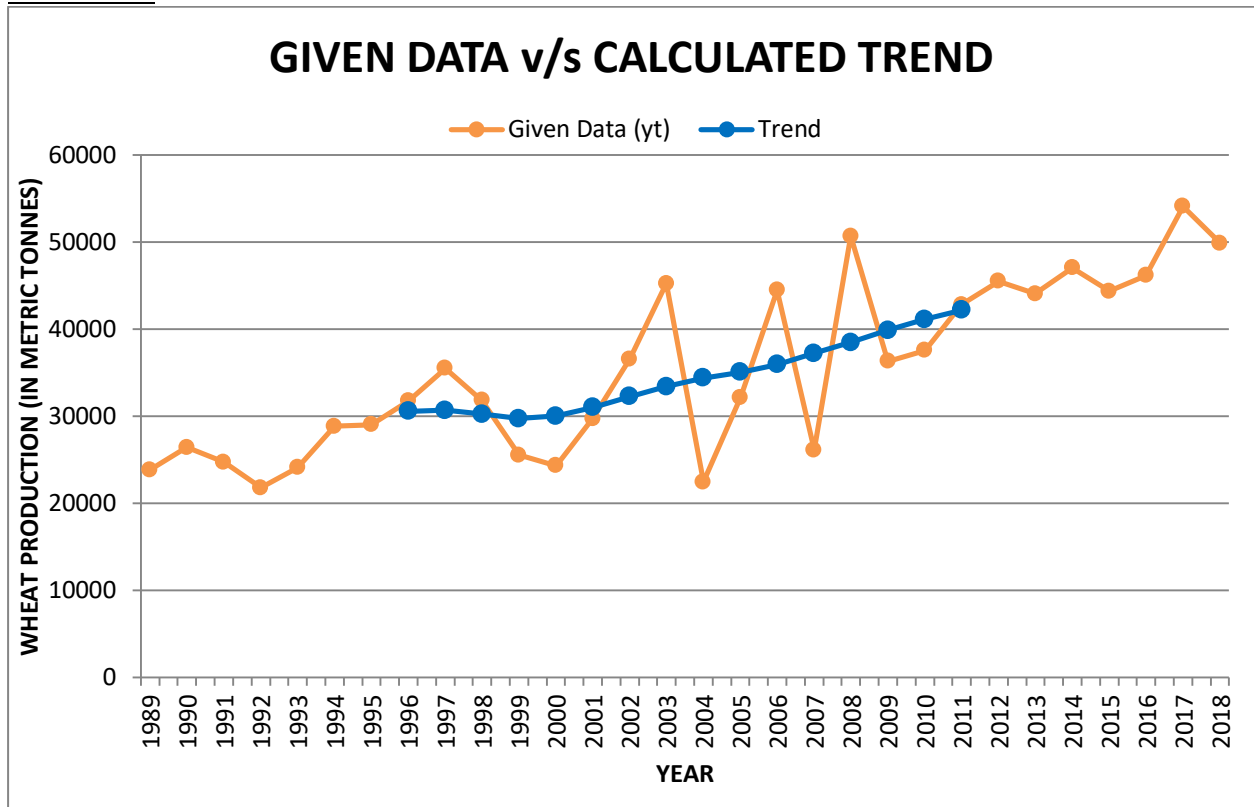
$$y = 1/320 [4]^2[5][-3,3,4,3,-3]yt$$

## CALCULATIONS:

TABLE-10.1

Year	yt	[4]yt	[4] <sup>2</sup> yt	[4] <sup>2</sup> [5]yt	[4] <sup>2</sup> [5][ <sup>-3,3,4,3,-3</sup> ]yt	Trend
1989	23832					
1990	26410					
1991	24735	96755				
1992	21778	97027	396983			
1993	24104	99463	413937			
1994	28846	103738	442023	2215116		
1995	29010	113709	470657	2313121		
1996	31749	125113	491516	2380441	9786367	30582.39688
1997	35508	128097	494988	2407673	9815654	30673.91875
1998	31830	124597	481257	2417477	9670151	30219.22188
1999	25510	117181	469255	2423143	9514879	29733.99688
2000	24333	111382	480461	2450294	9607049	30022.02813
2001	29709	116095	497182	2519329	9922816	31008.8
2002	36543	135803	522139	2589704	10316495	32239.04688
2003	45218	133902	550292	2668355	10690781	33408.69063
2004	22432	136339	539630	2751497	11006057	34393.92813
2005	32146	144248	559112	2816085	11219643	35061.38438
2006	44452	125141	580324	2894713	11499919	35937.24688
2007	26111	153384	586727	2992754	11911619	37223.80938
2008	50675	157551	628920	3083653	12311875	38474.60938
2009	36313	150651	637671	3182080	12752272	39850.85
2010	37552	167334	650011	3287700	13158270	41119.59375
2011	42794	162135	678751	3370615	13503316	42197.8625
2012	45476	169891	692347	3466552		
2013	44069	179391	711835	3565220		
2014	47052	180930	733608			
2015	44333	181623	748679			
2016	46169	191664				
2017	54110	194462				
2018	49850					

**GRAPH-10.1**



**RESULT:**

1. Trend values have been calculated using spencer's 15 point formula, and are shown in TABLE 10.1.
2. GRAPH 10.1 shows the line graph plotted for the given data and the calculated trend.

**CONCLUSION:**

1. The wheat production follows an overall upward trend.