The Moving-Average Method

The **moving-average method** is not only useful in smoothing a time series to see its trend; it is the basic method used in measuring the seasonal fluctuation .
In contrast to the least squares method, which expresses the trend in terms of a mathematical equation ($Y' = a + bt$), the moving-average method merely smooths the fluctuations in the data. This is accomplished by "moving" the arithmetic mean values through the time series.

To apply the moving-average method to a time series, the data should follow a fairly linear trend and have a definite pattern of fluctuations (repeating, say, every three years). The data in the following example have three components—trend, cycle, and irregular variation, abbreviated T, C, and I. There is no seasonal variation, because the data are recorded annually. What the moving-average method does, in effect, is average out C and I. The residual is trend.
For example, in the following time series the cycle repeats itself every seven years, and the amplitude of each cycle is 4; that is, there are exactly four units from the trough (lowest time period) to the peak. The seven-year moving average, therefore, averages out the cyclical and irregular fluctuations perfectly, and the residual is a linear trend.

Year	Sales ($ millions)	Seven-Year Moving Total	Seven-Year Moving Average
1980	1		
1981	2		
1982	3		
1983	4	22	3.143
1984	5	23	3.286
1985	4	24	3.429
1986	3	25	3.571
1987	2	26	3.714
1988	3	27	3.857
1989	4	28	4.000
1990	5	29	4.143
1991	6	30	4.286
1992	5	31	4.429
1993	4	32	4.571
1994	3	33	4.714
1995	4	34	4.857
1996	5	35	5.000
1997	6	36	5.143
1998	7	37	5.286
1999	6	38	5.429
2000	5	39	5.571
2001	4	40	5.714
2002	5	41	5.857
2003	6		
2004	7		
2005	8		

The first step in computing the seven-year moving average is to determine the seven-year moving totals. The total sales for the first seven years (1980–86 inclusive) are $22 million, found by $1+2+3+4+5+4+3$. The total of $22 million is divided by 7 to determine the arithmetic mean sales per year. The seven-year total (22) and the seven-year mean (3.143) are positioned opposite the middle year for that group of seven, namely, 1983. Then the total sales for the next seven years (1981–87 inclusive) are determined. (A convenient way of doing this is to subtract the sales for 1980 [$1 million] from the first seven-year total [$22 million] and add the sales for 1987 [$2 million], to give the new total of $23 million.) The mean of this total, $3.286 million, is positioned opposite the middle year, 1984. The sales data and seven-year moving average are shown graphically in

The above table

Question: Find the three- year and five year moving average?

Year	Production, Y
1987	5
1988	6
1989	8
1990	10
1991	5
1992	3
1993	7
1994	10
1995	12
1996	11
1997	9
1998	13
1999	15
2000	18
2001	15
2002	11
2003	14
2004	17
2005	22

Year	Production, Y	Three-Year Moving Total	Three-Year Moving Average	Five-Year Moving Total	Five-Year Moving Average
1987	5				
1988	6				
1989	8	19	6.3		
1990	10	24	8.0		
1991	5	23	7.7	34	6.8
1992	3	18	6.0	32	6.4
1993	7	15	5.0	33	6.6
1994	10	20	6.7	35	7.0
1995	12	29	9.7	37	7.4
1996	11	33	11.0	43	8.6
1997	9	32	10.7	49	9.8
1998	13	33	11.0	55	11.0
1999	15	37	12.3	60	12.0
2000	18	46	15.3	66	13.2
2001	15	48	16.0	70	14.0
2002	11	44	14.7	72	14.4
2003	14	40	13.3	73	14.6
2004	17	42	14.0	75	15.0
2005	22	53	17.7	79	15.8