

MATHEMATICS

SUPPORT CENTRE

Title: Index Numbers: Linking two series

Target: On completion of this worksheet you should be able to link two series of index numbers, and change the base of a series.

Linking two series.

As time passes it is sometimes appropriate to update the base year to a more recent one. We then have 2 series with 2 different base years. To recreate one series or compare price movements we need to link the 2.

Example.

	Old series with Jan 1990=100	New series with Jan 1997 = 100
1996	270	
1997	300	100
1998		104

The key figures are the index numbers for the 2 series for 1997:

300 in the old series is **100** in the new.

To change old to new we need to change the base of the old series to 1997, and to multiply each old number by $\frac{100}{300}$ i.e. $\frac{1}{3}$.

To find the value for 1996 in the new series we have $270 \times \frac{100}{300} = 270 \times \frac{1}{3} = 90$

We may wish to do this the other way round and rebase the new series to the old base.

100 in the new series is **300** in the old, so we multiply each number in the new series by $\frac{300}{100} = 3$

It helps to ask "Will the answer be larger than, or smaller than, the number I started with?"

Exercise

- Link the following 2 series, creating one index with 1997=100

	Old series	New series
1994	240	
1995	270	
1996	282	
1997	300	100
1998		104
1999		108

- Link the following 2 series of index numbers by recalculating the index for all years with the 'old' base year of 1995=100.

	Old series Jan '95=100	New series Jan '97=100
1994	90	
1995	100	
1996	120	
1997	150	100
1998		110
1999		120
2000		130

- Recalculate the first series of index numbers to have the same base year as the second, 1977.

	First series Jan '90=100	Second series Jan '97=100
1993	120	
1994	140	
1995	160	
1996	180	
1997	200	100
1998		110
1999		120
2000		130

4. Link the following 2 series of an index number using the base year of 1996 = 100.

	Old series 1996=100	New series 1998=100
1996	100	
1997	120	
1998	130	100
1999		120
2000		130

Answers:

Question 1	
1994	80
1995	90
1996	94
1997	100

Question 2	
1997	150
1998	165
1999	180
2000	195

Question 3	
1993	60
1994	70
1995	80
1996	90
1997	100

Question 4	
1996	100
1997	120
1998	130
1999	156
2000	169

Changing the base.

It is not only when we need to link 2 series that we can change the base of an index number. We can change the base of any series.

Example.

	Old series Jan 1987=100	New series Jan 1995=100
Jan 1995	200	100
Jan 1996	220	
Jan 1997	240	

We can rebase this series to 1995 = 100 in the same way as before.

New index for 1996 =

$$\text{old index for 1996} \times \frac{100}{\text{old index for 1995}}$$

$$= 220 \times \frac{100}{200} = 110$$

New index for 1997 =

$$240 \times \frac{100}{200} = 120$$

Exercise.

1. Rebase this index to 2000 = 100

1995	72
1996	94
1997	100
1998	140
1999	186
2000	200

2. Rebase this index to 1996 = 100

1995	108
1996	120
1997	132
1998	144
1999	156
2000	168

3. Rebase this index to 1998 = 100

1995	75
1996	99
1997	141
1998	150
1999	174
2000	201

4. Rebase this index to 1997 = 100

1995	150
1996	135
1997	125
1998	100
1999	90
2000	75

Answers

Question 1	
1995	36
1996	47
1997	50
1998	70
1999	93
2000	100

Question 2	
1995	90
1996	100
1997	110
1998	120
1999	130
2000	140

Question 3	
1995	50
1996	66
1997	94
1998	100
1999	116
2000	134

Question 4	
1995	120
1996	108
1997	100
1998	80
1999	72
2000	60