Chapter 3

Algebra and Sets

3.1. Some Basic Algebra

This section begins with some programs designed to support some of the earliest algebraic ideas introduced in schools. These programs illustrate the use of the format function (¥) to mix calculations and conversation, and also a prompting function ASK which is given in Appendix 2.

Difference of two squares

\[ \n \text{DIFFSQ;T} \n\]

[1] \( T \leftarrow \text{ASK}'\text{GIVE 2 NOS.}' \)

[2] \( '\text{DIFF OF SQQ} = ',(¥T[1]*2), \)

\( -',(¥T[2]*2),'=',¥-/T*2 \)

[3] \( '(X+Y) \times (X-Y) = ',(¥+/T),'\times', \)

\( (¥-/T),'=',¥\times/(+/T),-/T \)

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N. D. Thomson, APL Programs for the Mathematics Classroom
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Square of sum and sum of squares

\( \nSUMSQQ;T \)

[1] \( T \leftarrow ASK 'GIVE 2 NOS.' : \)
[2] \( 'SQ. OF SUM = ',(+T),'2 = ', \)
\( (+/T)*2 \)
[3] \( 'SUM OF SQ = ',(T[1]*2),'+', \)
\( (T[2]*2), '=' ,+/T*2 \)
[4] \( 'DIFFERENCE = 2 \times ',(T[1]),' \times ', \)
\( (T[2]), '=' ,2 \times /T \)

Examples:

\( DIFFSQ \)

\( GIVE 2 NOS.: \)

4 3
\( DIFF OF SQ = 16-9=7 \)
\( (X+Y)(X-Y) = 7 \times 1 = 7 \)

\( SUMSQQ \)

\( GIVE 2 NOS.: \)

4 3
\( SQ. OF SUM = 7 \times 2 = 49 \)
\( SUM OF SQ = 16+9=25 \)
\( DIFFERENCE = 2 \times 4 \times 3 = 24 \)

Expansion of Brackets

The next function concerns the expansion of a pair of terms each of the form \((ax + by)(cx + dy)\). \( R \) is a 2x2 matrix the first row of which is the value of the coefficients \(a,b\) and the second row is the coefficients \(c,d\). The result is the coefficients of the expansion in the order \(x^2, xy, y^2\).

\( EXPAND : ((+/R),+/0 1 \times R)[1 3 2] \)