

From: Interactive **Computer Manipulation of Formal Sums**

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<http://www.csd.uwo.ca/~watt/home/students/theses/NPatil2010-msc.pdf>

```
(6) -> )r syman
```

```
splitOp(x,s) ==  
  is?(x,'%defsum) => splitSum(x,s)  
  error(":-(")
```

Type: Void

```
splitSum(x,s) ==  
  A:=argument mainKernel(x)  
  S1:=summation(subst(A.1,A.2=A.3),A.3::Symbol=A.4..s)  
  S2:=summation(subst(A.1,A.2=A.3),A.3::Symbol=s+1..A.5)  
  S1+S2
```

Type: Void

```
multiplySum(x,s) ==  
  A:=argument mainKernel(x)  
  summation(s*subst(A.1,A.2=A.3),A.3::Symbol=A.4..A.5)
```

Type: Void

```
splitFunctions(x) ==  
  A:=argument mainKernel(x)  
  B:=isPlus A.1  
  test(B::OutputForm="failed"::OutputForm) => x  
  reduce(+,[summation(subst(B.j,A.2=A.3),A.3::Symbol=A.4..A.5) for j in 1..#B])
```

Type: Void

```
setLow!(x,a) ==  
  A:=argument mainKernel(x)  
  summation(subst(A.1,A.2=A.3),A.3::Symbol=a..A.5)
```

Type: Void

```
setHigh!(x,b) ==  
  A:=argument mainKernel(x)  
  summation(subst(A.1,A.2=A.3),A.3::Symbol=A.4..b)
```

Type: Void

```
setRange!(x,a,b) ==  
  A:=argument mainKernel(x)  
  summation(subst(A.1,A.2=A.3),A.3::Symbol=a..b)
```

Type: Void

```
setOp!(x,g) ==  
  A:=argument mainKernel(x)  
  summation(g(A.3),A.3::Symbol=A.4..A.5)
```

Type: Void

```

takeNTermsHigh(x,n) ==
  A:=argument mainKernel(x)
  summation(subst(A.1,A.2=A.3),A.3::Symbol=A.5-n+1..A.5)

```

Type: Void

```

takeNTermsLow(x,n) ==
  A:=argument mainKernel(x)
  summation(subst(A.1,A.2=A.3),A.3::Symbol=A.4..A.4+n-1)

```

Type: Void

```

shiftNTerms(x,n) ==
  A:=argument mainKernel(x)
  summation(subst(A.1,A.2=A.3-n),A.3::Symbol=A.4+n..A.5+n)

```

(23) -> X := operator 'X

X

Type: BasicOperator

(24) -> T:=summation(X(s),s=a..b)

$$\sum_{s=a}^b X(s)$$

Type: Expression(Integer)

(26) -> splitOp(T,c)

$$\sum_{s=c+1}^b X(s) + \sum_{s=a}^c X(s)$$

Type: Expression(Integer)

(29) -> multiplySum(T,z^s)

$$\sum_{s=a}^b X(s) z^s$$

Type: Expression(Integer)

(31) -> takeNTermsHigh(T,2)

$$\sum_{s=b-1}^b X(s)$$

Type: Expression(Integer)

(32) -> takeNTermsLow(T,3)

$$\sum_{s=a}^{a+2} X(s)$$

Type: Expression(Integer)

(35) -> `shiftNTerms(T,j)`

$$\sum_{s=j+a}^{j+b} X(s-j)$$

Type: Expression(Integer)

(37) -> `splitTermsEvenOdd(T)`

$$\sum_{s=\text{ceiling}(\frac{a}{2})+1}^{\text{ceiling}(\frac{b}{2})} X(2s) + \sum_{s=\text{ceiling}(\frac{a}{2})}^{\text{floor}(\frac{b}{2})} X(2s)$$

Type: Expression(Integer)

(50) -> `U(b) == summation(X(s),s=a..b)`

Type: Void

(52) -> `U(x)`

$$\sum_{s=a}^x X(s)$$

Type: Expression(Integer)

(41) -> `Y:= operator 'Y`

Y

Type: BasicOperator

(44) -> `V(b) == summation(Y(n),n=a..b)`

Type: Void

(46) -> `V(x)`

$$\sum_{n=a}^x Y(n)$$

Type: Expression(Integer)

(54) -> `summation(V(k),k=-N..N)`

$$\sum_{k=-N}^N \sum_{n=a}^k Y(n)$$

Type: Expression(Integer)

(56) -> `%+V(N)`

$$\sum_{k=-N}^N \sum_{n=a}^k Y(n) + 2 \left(\sum_{n=a}^N Y(n) \right)$$

Type: Expression(Integer)

(57) ->