Pensieve header: Computations related to the weight system of pA.

```
SetDirectory["C:\\drorbn\\AcademicPensieve\\2010-08"];
<< pA.m
```

"Points" P

```
pA[P[i_, j_]] := AHD[
  t[i] == t[j], {i}, W[j],
  W[j] - W[i]
 ]
```

```
Ptest1 = pA[CircuitDiagram[Xm[i, j, k, l], P[l, m]]]
```

```
AHD[(t[i] == t[k]) (t[j] == t[l] == t[m]), {i, j}, W[k, m],
 t[j] W[i, j] - t[j] W[i, m] + W[j, k] - W[j, m] + t[i] W[j, m] + W[k, m]]
```

```
Ptest2 = pA[CircuitDiagram[Xm[i, j, k, m]]]
```

```
AHD[(t[i] == t[k]) (t[j] == t[m]), {i, j}, W[k, m],
 t[j] W[i, j] - t[j] W[i, m] + W[j, k] - W[j, m] + t[i] W[j, m] + W[k, m]]
```

```
Last[Ptest1] == Last[Ptest2]
```

```
True
```

The "SemiVirtual" SVXp

```
diff1 = pA[Xp[j, k, l, i]] - pA[CircuitDiagram[P[i, k], P[j, l]]]
```

```
-AHD[(t[i] == t[k]) (t[j] == t[l]), {i, j}, W[k, l], W[i, j] - W[i, l] + W[j, k] + W[k, l]] +
 AHD[(t[j] == t[l]) (t[k] == t[i]), {j, i}, W[k, l],
  W[i, j] + (-1 + t[j]) W[i, k] - t[i] W[i, l] + W[j, k] + t[i] W[k, l]]
```

```
diff2 = Expand[diff1 /. AHD[_, _, W[k, l], p_] :> p]
```

```
-W[i, k] + t[j] W[i, k] + W[i, l] - t[i] W[i, l] - W[k, l] + t[i] W[k, l]
```

```
diff3 = Expand[diff2 /. t[i_] :> 1 + x[i]]
```

```
-W[i, l] x[i] + W[k, l] x[i] + W[i, k] x[j]
```

```
pA[SVXp[i_, j_, k_, l_]] := AHD[
   (t[i] == t[k]) (t[j] == t[l]), {i, j}, W[k, l],
   -W[i, k] + t[j] W[i, k] + W[i, l] - t[i] W[i, l] - W[k, l] + t[i] W[k, l]
 ]
```

The "Blob" B

```
pA[CircuitDiagram[SVXp[i, l, k, j], P[k, l]]]
```

```
AHD[t[i] == t[j] == t[k] == t[l], {i}, W[j], W[i] - t[i] W[i] - W[j] + t[i] W[j]]
```

```
pA[CircuitDiagram[SVXp[l, i, j, k], P[k, l]]]
```

```
AHD[t[i] == t[j] == t[k] == t[l], {i}, W[j], 0]
```

```
pA[B[i_, j_]] := AHD[
  (t[i] == t[j]), {i}, W[j], W[i] - t[i] W[i] - W[j] + t[i] W[j]
 ]
```

■ The Archibald Relation

```
ArchL1 = pA[CircuitDiagram[SVXp[i, k, l, p], SVXp[j, p, m, n]]]
```

```
AHD[(t[i] == t[l]) (t[j] == t[m]) (t[k] == t[n] == t[p]), {i, j, k},
 W[l, m, n], -W[i, j, m] + t[i] W[i, j, m] + t[k] W[i, j, m] - t[i] t[k] W[i, j, m] +
  W[i, j, n] - t[i] W[i, j, n] - t[j] W[i, j, n] + t[i] t[j] W[i, j, n] - W[i, m, n] +
  t[i] W[i, m, n] + t[j] W[i, m, n] - t[i] t[j] W[i, m, n] - W[j, l, m] + t[i] W[j, l, m] +
  t[k] W[j, l, m] - t[i] t[k] W[j, l, m] + W[j, l, n] - t[i] W[j, l, n] - t[j] W[j, l, n] +
  t[i] t[j] W[j, l, n] + W[l, m, n] - t[i] W[l, m, n] - t[j] W[l, m, n] + t[i] t[j] W[l, m, n]]
```

```
ArchL2 = pA[CircuitDiagram[SVXp[j, k, m, p], SVXp[i, p, l, n]]]
```

```
AHD[(t[i] == t[l]) (t[j] == t[m]) (t[k] == t[n] == t[p]), {i, j, k},
 W[l, m, n], -W[i, j, l] + t[j] W[i, j, l] + t[k] W[i, j, l] - t[j] t[k] W[i, j, l] +
  W[i, j, n] - t[i] W[i, j, n] - t[j] W[i, j, n] + t[i] t[j] W[i, j, n] - W[i, l, m] +
  t[j] W[i, l, m] + t[k] W[i, l, m] - t[j] t[k] W[i, l, m] - W[i, m, n] + t[i] W[i, m, n] +
  t[j] W[i, m, n] - t[i] t[j] W[i, m, n] + W[j, l, n] - t[i] W[j, l, n] - t[j] W[j, l, n] +
  t[i] t[j] W[j, l, n] + W[l, m, n] - t[i] W[l, m, n] - t[j] W[l, m, n] + t[i] t[j] W[l, m, n]]
```

```
ArchL = Expand[
  (ArchL1 - ArchL2) /. AHD[_, _, W[l, m, n], p_] :> p /. t[i_] :> (1 + x[i])
 ]
```

```
-W[i, j, m] x[i] x[k] - W[j, l, m] x[i] x[k] + W[i, j, l] x[j] x[k] + W[i, l, m] x[j] x[k]
```

```
ArchR1 = pA[CircuitDiagram[SVXp[i, k, l, n], B[j, m]]]
```

```
AHD[(t[i] == t[l]) (t[j] == t[m]) (t[k] == t[n]), {i, j, k}, W[l, m, n],
 -W[i, j, l] + t[j] W[i, j, l] + t[k] W[i, j, l] - t[j] t[k] W[i, j, l] +
  W[i, j, n] - t[i] W[i, j, n] - t[j] W[i, j, n] + t[i] t[j] W[i, j, n] - W[i, l, m] +
  t[j] W[i, l, m] + t[k] W[i, l, m] - t[j] t[k] W[i, l, m] - W[i, m, n] + t[i] W[i, m, n] +
  t[j] W[i, m, n] - t[i] t[j] W[i, m, n] + W[j, l, n] - t[i] W[j, l, n] - t[j] W[j, l, n] +
  t[i] t[j] W[j, l, n] + W[l, m, n] - t[i] W[l, m, n] - t[j] W[l, m, n] + t[i] t[j] W[l, m, n]]
```

```
ArchR2 = pA[CircuitDiagram[SVXp[j, k, m, n], B[i, l]]]
```

```
AHD[(t[i] == t[l]) (t[j] == t[m]) (t[k] == t[n]), {i, j, k}, W[l, m, n],
 -W[i, j, m] + t[i] W[i, j, m] + t[k] W[i, j, m] - t[i] t[k] W[i, j, m] +
  W[i, j, n] - t[i] W[i, j, n] - t[j] W[i, j, n] + t[i] t[j] W[i, j, n] - W[i, m, n] +
  t[i] W[i, m, n] + t[j] W[i, m, n] - t[i] t[j] W[i, m, n] - W[j, l, m] + t[i] W[j, l, m] +
  t[k] W[j, l, m] - t[i] t[k] W[j, l, m] + W[j, l, n] - t[i] W[j, l, n] - t[j] W[j, l, n] +
  t[i] t[j] W[j, l, n] + W[l, m, n] - t[i] W[l, m, n] - t[j] W[l, m, n] + t[i] t[j] W[l, m, n]]
```

```
ArchR = Expand[
  (-ArchR1 + ArchR2) /. AHD[_, _, W[l, m, n], p_] :> p /. t[i_] :> (1 + x[i])
 ]
```

```
-W[i, j, m] x[i] x[k] - W[j, l, m] x[i] x[k] + W[i, j, l] x[j] x[k] + W[i, l, m] x[j] x[k]
```

```
ArchL == ArchR
```

```
True
```

Horizontal Arrow Diagrams

```
pW[n_, had_HAD] := Module[
   {l = Length[had], tail, head, tops = Range[n]},
   cd = CircuitDiagram @@ Table[
      {tail, head} = IntegerDigits[had[[i]]];
      If[tail == head,
       B[tops[[head]], tops[[head]] += 10],
       SVXp[tops[[tail]], tops[[head]], tops[[tail]] += 10, tops[[head]] += 10]
      ],
      {i, l}
     ];
   Print[cd];
   Expand[Signature[tops] * Last[pA[cd]] /. t[i_] :> 1 + x[i]] /.
    Thread[tops → 10 + Range[n]]
  ];
pW[n_, expr_] := expr /. had_HAD :> pW[n, had]
```

```
pW[5, HAD[11, 21, 34, 22]]
```

```
CircuitDiagram[B[1, 11], SVXp[2, 11, 12, 21], SVXp[3, 4, 13, 14], B[12, 22]]
```

$$W[2, 3, 14, 12]\, x[1]^2\, x[2]\, x[3] - W[2, 13, 14, 12]\, x[1]^2\, x[2]\, x[3] - W[2, 3, 14, 11]\, x[1]\, x[2]^2\, x[3] + W[2, 13, 14, 11]\, x[1]\, x[2]^2\, x[3] - W[3, 14, 11, 12]\, x[1]\, x[2]^2\, x[3] + W[13, 14, 11, 12]\, x[1]\, x[2]^2\, x[3] - W[2, 3, 13, 12]\, x[1]^2\, x[2]\, x[4] + W[2, 3, 13, 11]\, x[1]\, x[2]^2\, x[4] + W[3, 13, 11, 12]\, x[1]\, x[2]^2\, x[4]$$

```
pW[2, HAD[11, 22]]
```

```
CircuitDiagram[B[1, 11], B[2, 12]]
```

$$W[1, 2]\, x[1]\, x[2] - W[1, 12]\, x[1]\, x[2] + W[2, 11]\, x[1]\, x[2] + W[11, 12]\, x[1]\, x[2]$$

```
Simplify[pW[2, HAD[12]]]
```

```
CircuitDiagram[SVXp[1, 2, 11, 12]]
```

$$-W[1, 12]\, x[1] + W[11, 12]\, x[1] + W[1, 11]\, x[2]$$

```
Simplify[pW[2, HAD[12, 12]]]
```

```
CircuitDiagram[SVXp[1, 2, 11, 12], SVXp[11, 12, 21, 22]]
```

$$x[1]\, (-W[1, 12]\, x[1] + W[11, 12]\, x[1] + W[1, 11]\, x[2])$$

```
Simplify[pW[2, HAD[12, 12, 12]]]
```

```
CircuitDiagram[SVXp[1, 2, 11, 12], SVXp[11, 12, 21, 22], SVXp[21, 22, 31, 32]]
```

$$x[1]^2\, (-W[1, 12]\, x[1] + W[11, 12]\, x[1] + W[1, 11]\, x[2])$$

```
Simplify[pW[2, HAD[12, 12, 12, 12]]]
```

```
CircuitDiagram[SVXp[1, 2, 11, 12], SVXp[11, 12, 21, 22], SVXp[21, 22, 31, 32], SVXp[31, 32, 41, 42]]
```

$$x[1]^3\, (-W[1, 12]\, x[1] + W[11, 12]\, x[1] + W[1, 11]\, x[2])$$

```
Simplify[pW[2, HAD[12, 21]]]
```

```
CircuitDiagram[SVXp[1, 2, 11, 12], SVXp[12, 11, 22, 21]]
```

```
x[2] (-W[1, 12] x[1] + W[11, 12] x[1] + W[1, 11] x[2])
```

```
Simplify[pW[2, HAD[21, 12]]]
```

```
CircuitDiagram[SVXp[2, 1, 12, 11], SVXp[11, 12, 21, 22]]
```

```
x[1] (-W[2, 12] x[1] + (W[2, 11] + W[11, 12]) x[2])
```

■ 4T and OC

```
Print /@ (FourT = pW[3, {HAD[12, 23], HAD[13, 23], HAD[23, 12], HAD[23, 13]}]);
```

```
CircuitDiagram[SVXp[1, 2, 11, 12], SVXp[12, 3, 22, 13]]
```

```
CircuitDiagram[SVXp[1, 3, 11, 13], SVXp[2, 13, 12, 23]]
```

```
CircuitDiagram[SVXp[2, 3, 12, 13], SVXp[1, 12, 11, 22]]
```

```
CircuitDiagram[SVXp[2, 3, 12, 13], SVXp[1, 13, 11, 23]]
```

```
W[1, 13, 12] x[1] x[2] - W[11, 13, 12] x[1] x[2] + W[1, 11, 13] x[2]^2 - W[1, 11, 12] x[2] x[3]
```

```
W[1, 2, 13] x[1] x[2] - W[1, 12, 13] x[1] x[2] + W[2, 11, 13] x[1] x[2] +
 W[11, 12, 13] x[1] x[2] - W[1, 2, 12] x[1] x[3] - W[2, 11, 12] x[1] x[3]
```

```
W[1, 13, 12] x[1] x[2] - W[11, 13, 12] x[1] x[2] + W[1, 11, 13] x[2]^2 -
 W[1, 2, 12] x[1] x[3] - W[2, 11, 12] x[1] x[3] + W[1, 2, 11] x[2] x[3]
```

```
W[1, 2, 13] x[1] x[2] - W[1, 12, 13] x[1] x[2] + W[2, 11, 13] x[1] x[2] +
 W[11, 12, 13] x[1] x[2] - W[1, 2, 11] x[2] x[3] - W[1, 11, 12] x[2] x[3]
```

```
Expand[{1, 1, -1, -1}.FourT]
```

```
0
```

```
FourT2 = pW[3, {HAD[21, 23], HAD[31, 23], HAD[23, 21], HAD[23, 31]}]
```

```
CircuitDiagram[SVXp[2, 1, 12, 11], SVXp[12, 3, 22, 13]]
```

```
CircuitDiagram[SVXp[3, 1, 13, 11], SVXp[2, 13, 12, 23]]
```

```
CircuitDiagram[SVXp[2, 3, 12, 13], SVXp[12, 1, 22, 11]]
```

```
CircuitDiagram[SVXp[2, 3, 12, 13], SVXp[13, 1, 23, 11]]
```

```
{W[2, 13, 12] x[1] x[2] + W[2, 11, 13] x[2]^2 - W[11, 13, 12] x[2]^2 - W[2, 11, 12] x[2] x[3],
 -W[2, 3, 13] x[1] x[2] - W[3, 12, 13] x[1] x[2] + W[2, 3, 12] x[1] x[3] +
  W[2, 11, 13] x[2] x[3] + W[11, 12, 13] x[2] x[3] - W[2, 11, 12] x[3]^2,
 W[2, 13, 12] x[1] x[2] + W[2, 11, 13] x[2]^2 - W[11, 13, 12] x[2]^2 - W[2, 11, 12] x[2] x[3],
 -W[2, 12, 13] x[1] x[3] + W[2, 11, 13] x[2] x[3] + W[11, 12, 13] x[2] x[3] - W[2, 11, 12] x[3]^2}
```

```
{1, 1, -1, -1}.FourT2
```

```
-W[2, 3, 13] x[1] x[2] - W[3, 12, 13] x[1] x[2] + W[2, 3, 12] x[1] x[3] + W[2, 12, 13] x[1] x[3]
```

```
OC = pW[3, {HAD[12, 13], HAD[13, 12]}]
```

```
CircuitDiagram[SVXp[1, 2, 11, 12], SVXp[11, 3, 21, 13]]
```

```
CircuitDiagram[SVXp[1, 3, 11, 13], SVXp[11, 2, 21, 12]]
```

```
{-W[1, 12, 13] x[1]^2 + W[12, 13, 11] x[1]^2 - W[1, 13, 11] x[1] x[2] + W[1, 12, 11] x[1] x[3],
 -W[1, 12, 13] x[1]^2 + W[12, 13, 11] x[1]^2 - W[1, 13, 11] x[1] x[2] + W[1, 12, 11] x[1] x[3]}
```

```
{1, -1}.OC
```

```
0
```

■ No-vertex relations?

```
pW[6, HAD[14, 25, 36]]
```

```
CircuitDiagram[SVXp[1, 4, 11, 14], SVXp[2, 5, 12, 15], SVXp[3, 6, 13, 16]]
```

```
-W[1, 2, 3, 14, 15, 16] x[1] x[2] x[3] +
 W[1, 2, 13, 14, 15, 16] x[1] x[2] x[3] - W[1, 3, 12, 14, 15, 16] x[1] x[2] x[3] -
 W[1, 12, 13, 14, 15, 16] x[1] x[2] x[3] + W[2, 3, 11, 14, 15, 16] x[1] x[2] x[3] +
 W[2, 11, 13, 14, 15, 16] x[1] x[2] x[3] - W[3, 11, 12, 14, 15, 16] x[1] x[2] x[3] +
 W[11, 12, 13, 14, 15, 16] x[1] x[2] x[3] + W[1, 2, 3, 11, 15, 16] x[2] x[3] x[4] +
 W[1, 2, 11, 13, 15, 16] x[2] x[3] x[4] - W[1, 3, 11, 12, 15, 16] x[2] x[3] x[4] +
 W[1, 11, 12, 13, 15, 16] x[2] x[3] x[4] - W[1, 2, 3, 12, 14, 16] x[1] x[3] x[5] -
 W[1, 2, 12, 13, 14, 16] x[1] x[3] x[5] + W[2, 3, 11, 12, 14, 16] x[1] x[3] x[5] -
 W[2, 11, 12, 13, 14, 16] x[1] x[3] x[5] - W[1, 2, 3, 11, 12, 16] x[3] x[4] x[5] +
 W[1, 2, 11, 12, 13, 16] x[3] x[4] x[5] + W[1, 2, 3, 13, 14, 15] x[1] x[2] x[6] +
 W[1, 3, 12, 13, 14, 15] x[1] x[2] x[6] - W[2, 3, 11, 13, 14, 15] x[1] x[2] x[6] +
 W[3, 11, 12, 13, 14, 15] x[1] x[2] x[6] + W[1, 2, 3, 11, 13, 15] x[2] x[4] x[6] -
 W[1, 3, 11, 12, 13, 15] x[2] x[4] x[6] - W[1, 2, 3, 12, 13, 14] x[1] x[5] x[6] +
 W[2, 3, 11, 12, 13, 14] x[1] x[5] x[6] + W[1, 2, 3, 11, 12, 13] x[4] x[5] x[6]
```

```
pW[6, Total[
   (Signature[#] * HAD @@ ({10, 20, 30} + #)) & /@ Permutations[{4, 5, 6}]
  ]]
```

```
CircuitDiagram[SVXp[1, 4, 11, 14], SVXp[2, 5, 12, 15], SVXp[3, 6, 13, 16]]
```

```
CircuitDiagram[SVXp[1, 4, 11, 14], SVXp[2, 6, 12, 16], SVXp[3, 5, 13, 15]]
```

```
CircuitDiagram[SVXp[1, 5, 11, 15], SVXp[2, 4, 12, 14], SVXp[3, 6, 13, 16]]
```

```
CircuitDiagram[SVXp[1, 5, 11, 15], SVXp[2, 6, 12, 16], SVXp[3, 4, 13, 14]]
```

```
CircuitDiagram[SVXp[1, 6, 11, 16], SVXp[2, 4, 12, 14], SVXp[3, 5, 13, 15]]
```

```
CircuitDiagram[SVXp[1, 6, 11, 16], SVXp[2, 5, 12, 15], SVXp[3, 4, 13, 14]]
```

```
-2 W[1, 2, 3, 12, 13, 16] x[1] x[4] x[5] +
 2 W[2, 3, 11, 12, 13, 16] x[1] x[4] x[5] + 2 W[1, 2, 3, 11, 13, 16] x[2] x[4] x[5] -
 2 W[1, 3, 11, 12, 13, 16] x[2] x[4] x[5] - 2 W[1, 2, 3, 11, 12, 16] x[3] x[4] x[5] +
 2 W[1, 2, 11, 12, 13, 16] x[3] x[4] x[5] - 2 W[1, 2, 3, 12, 13, 15] x[1] x[4] x[6] +
 2 W[2, 3, 11, 12, 13, 15] x[1] x[4] x[6] + 2 W[1, 2, 3, 11, 13, 15] x[2] x[4] x[6] -
 2 W[1, 3, 11, 12, 13, 15] x[2] x[4] x[6] - 2 W[1, 2, 3, 11, 12, 15] x[3] x[4] x[6] +
 2 W[1, 2, 11, 12, 13, 15] x[3] x[4] x[6] - 2 W[1, 2, 3, 12, 13, 14] x[1] x[5] x[6] +
 2 W[2, 3, 11, 12, 13, 14] x[1] x[5] x[6] + 2 W[1, 2, 3, 11, 13, 14] x[2] x[5] x[6] -
 2 W[1, 3, 11, 12, 13, 14] x[2] x[5] x[6] - 2 W[1, 2, 3, 11, 12, 14] x[3] x[5] x[6] +
 2 W[1, 2, 11, 12, 13, 14] x[3] x[5] x[6] + 6 W[1, 2, 3, 11, 12, 13] x[4] x[5] x[6]
```

```
pW[6, Total[
  (HAD @@ ({10, 20, 30} + #)) & /@ Permutations[{4, 5, 6}]
 ]]
```

```
CircuitDiagram[SVXp[1, 4, 11, 14], SVXp[2, 5, 12, 15], SVXp[3, 6, 13, 16]]
```

```
CircuitDiagram[SVXp[1, 4, 11, 14], SVXp[2, 6, 12, 16], SVXp[3, 5, 13, 15]]
```

```
CircuitDiagram[SVXp[1, 5, 11, 15], SVXp[2, 4, 12, 14], SVXp[3, 6, 13, 16]]
```

```
CircuitDiagram[SVXp[1, 5, 11, 15], SVXp[2, 6, 12, 16], SVXp[3, 4, 13, 14]]
```

```
CircuitDiagram[SVXp[1, 6, 11, 16], SVXp[2, 4, 12, 14], SVXp[3, 5, 13, 15]]
```

```
CircuitDiagram[SVXp[1, 6, 11, 16], SVXp[2, 5, 12, 15], SVXp[3, 4, 13, 14]]
```

```
-6 W[1, 2, 3, 14, 15, 16] x[1] x[2] x[3] + 6 W[1, 2, 13, 14, 15, 16] x[1] x[2] x[3] -
 6 W[1, 3, 12, 14, 15, 16] x[1] x[2] x[3] - 6 W[1, 12, 13, 14, 15, 16] x[1] x[2] x[3] +
 6 W[2, 3, 11, 14, 15, 16] x[1] x[2] x[3] + 6 W[2, 11, 13, 14, 15, 16] x[1] x[2] x[3] -
 6 W[3, 11, 12, 14, 15, 16] x[1] x[2] x[3] + 6 W[11, 12, 13, 14, 15, 16] x[1] x[2] x[3] +
 2 W[1, 2, 3, 13, 15, 16] x[1] x[2] x[4] + 2 W[1, 3, 12, 13, 15, 16] x[1] x[2] x[4] -
 2 W[2, 3, 11, 13, 15, 16] x[1] x[2] x[4] + 2 W[3, 11, 12, 13, 15, 16] x[1] x[2] x[4] +
 2 W[1, 2, 3, 12, 15, 16] x[1] x[3] x[4] + 2 W[1, 2, 12, 13, 15, 16] x[1] x[3] x[4] -
 2 W[2, 3, 11, 12, 15, 16] x[1] x[3] x[4] + 2 W[2, 11, 12, 13, 15, 16] x[1] x[3] x[4] +
 2 W[1, 2, 3, 11, 15, 16] x[2] x[3] x[4] + 2 W[1, 2, 11, 13, 15, 16] x[2] x[3] x[4] -
 2 W[1, 3, 11, 12, 15, 16] x[2] x[3] x[4] + 2 W[1, 11, 12, 13, 15, 16] x[2] x[3] x[4] -
 2 W[1, 2, 3, 13, 14, 16] x[1] x[2] x[5] - 2 W[1, 3, 12, 13, 14, 16] x[1] x[2] x[5] +
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 2 W[1, 2, 3, 12, 14, 16] x[1] x[3] x[5] - 2 W[1, 2, 12, 13, 14, 16] x[1] x[3] x[5] +
 2 W[2, 3, 11, 12, 14, 16] x[1] x[3] x[5] - 2 W[2, 11, 12, 13, 14, 16] x[1] x[3] x[5] -
 2 W[1, 2, 3, 11, 14, 16] x[2] x[3] x[5] - 2 W[1, 2, 11, 13, 14, 16] x[2] x[3] x[5] +
 2 W[1, 3, 11, 12, 14, 16] x[2] x[3] x[5] - 2 W[1, 11, 12, 13, 14, 16] x[2] x[3] x[5] +
 2 W[1, 2, 3, 13, 14, 15] x[1] x[2] x[6] + 2 W[1, 3, 12, 13, 14, 15] x[1] x[2] x[6] -
 2 W[2, 3, 11, 13, 14, 15] x[1] x[2] x[6] + 2 W[3, 11, 12, 13, 14, 15] x[1] x[2] x[6] +
 2 W[1, 2, 3, 12, 14, 15] x[1] x[3] x[6] + 2 W[1, 2, 12, 13, 14, 15] x[1] x[3] x[6] -
 2 W[2, 3, 11, 12, 14, 15] x[1] x[3] x[6] + 2 W[2, 11, 12, 13, 14, 15] x[1] x[3] x[6] +
 2 W[1, 2, 3, 11, 14, 15] x[2] x[3] x[6] + 2 W[1, 2, 11, 13, 14, 15] x[2] x[3] x[6] -
 2 W[1, 3, 11, 12, 14, 15] x[2] x[3] x[6] + 2 W[1, 11, 12, 13, 14, 15] x[2] x[3] x[6]
```

```
(P[1234] - P[2134] - P[1243] + P[2143]) - (P[3412] - P[4312] - P[3421] + P[4321]) /.
 P[p_] :> pW[8, HAD @@ ({50, 60, 70, 80} + IntegerDigits[p])]
```

```
CircuitDiagram[SVXp[5, 1, 15, 11], SVXp[6, 2, 16, 12], SVXp[7, 3, 17, 13], SVXp[8, 4, 18, 14]]
```

```
CircuitDiagram[SVXp[5, 1, 15, 11], SVXp[6, 2, 16, 12], SVXp[7, 4, 17, 14], SVXp[8, 3, 18, 13]]
```

```
CircuitDiagram[SVXp[5, 2, 15, 12], SVXp[6, 1, 16, 11], SVXp[7, 3, 17, 13], SVXp[8, 4, 18, 14]]
```

```
CircuitDiagram[SVXp[5, 2, 15, 12], SVXp[6, 1, 16, 11], SVXp[7, 4, 17, 14], SVXp[8, 3, 18, 13]]
```

```
CircuitDiagram[SVXp[5, 3, 15, 13], SVXp[6, 4, 16, 14], SVXp[7, 1, 17, 11], SVXp[8, 2, 18, 12]]
```

```
CircuitDiagram[SVXp[5, 3, 15, 13], SVXp[6, 4, 16, 14], SVXp[7, 2, 17, 12], SVXp[8, 1, 18, 11]]
```

```
CircuitDiagram[SVXp[5, 4, 15, 14], SVXp[6, 3, 16, 13], SVXp[7, 1, 17, 11], SVXp[8, 2, 18, 12]]
```

```
CircuitDiagram[SVXp[5, 4, 15, 14], SVXp[6, 3, 16, 13], SVXp[7, 2, 17, 12], SVXp[8, 1, 18, 11]]
```

```
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 2 W[6, 7, 8, 14, 15, 16, 17, 18] x[1] x[2] x[3] x[5] +
 2 W[5, 6, 7, 8, 13, 16, 17, 18] x[1] x[2] x[4] x[5] -
 2 W[6, 7, 8, 13, 15, 16, 17, 18] x[1] x[2] x[4] x[5] -
 2 W[5, 6, 7, 8, 12, 16, 17, 18] x[1] x[3] x[4] x[5] +
 2 W[6, 7, 8, 12, 15, 16, 17, 18] x[1] x[3] x[4] x[5] -
 2 W[5, 6, 7, 8, 11, 16, 17, 18] x[2] x[3] x[4] x[5] +
 2 W[6, 7, 8, 11, 15, 16, 17, 18] x[2] x[3] x[4] x[5] -
 2 W[5, 6, 7, 8, 14, 15, 17, 18] x[1] x[2] x[3] x[6] +
 2 W[5, 7, 8, 14, 15, 16, 17, 18] x[1] x[2] x[3] x[6] -
 2 W[5, 6, 7, 8, 13, 15, 17, 18] x[1] x[2] x[4] x[6] +
 2 W[5, 7, 8, 13, 15, 16, 17, 18] x[1] x[2] x[4] x[6] +
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 2 W[5, 6, 7, 8, 11, 15, 17, 18] x[2] x[3] x[4] x[6] -
 2 W[5, 7, 8, 11, 15, 16, 17, 18] x[2] x[3] x[4] x[6] -
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 2 W[5, 6, 7, 8, 11, 15, 16, 18] x[2] x[3] x[4] x[7] -
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 2 W[5, 6, 7, 8, 12, 14, 15, 18] x[1] x[3] x[6] x[7] -
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 2 W[5, 8, 12, 14, 15, 16, 17, 18] x[1] x[3] x[6] x[7] +
 2 W[5, 6, 7, 8, 11, 14, 15, 18] x[2] x[3] x[6] x[7] -
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2 W[5, 6, 8, 11, 14, 15, 17, 18] x[2] x[3] x[6] x[7] +
2 W[5, 7, 8, 11, 14, 15, 16, 18] x[2] x[3] x[6] x[7] +
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2 W[5, 7, 8, 12, 13, 15, 16, 18] x[1] x[4] x[6] x[7] +
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2 W[5, 6, 7, 12, 13, 15, 17, 18] x[1] x[4] x[6] x[8] -
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