```
cs = Last /@ {c[0] → - 11/15360 , c[1] → - 19/46080 , c[2] → - 187/138240 , c[3] → - 169/138240 ,
       c[4] → - 169/138240 , c[5] → - 187/138240 , c[6] → - 19/46080 , c[7] → - 11/15360 }
```

$$\left\{ -\frac{11}{15360}, -\frac{19}{46080}, -\frac{187}{138240}, -\frac{169}{138240}, -\frac{169}{138240}, -\frac{187}{138240}, -\frac{19}{46080}, -\frac{11}{15360} \right\}$$

```
-138240 * cs
```

$$\{99, 57, 187, 169, 169, 187, 57, 99\}$$

```
pol = - 1/4 Diag[1, ar[1, 2]] + 1/4 Diag[1, ar[2, 1]] + 1/32 Diag[h[1], ar[1, 2]] +
       5/96 Diag[h[1], ar[2, 1]] - 19 Diag[h[1]^3, ar[1, 2]]/46080 - 11 Diag[h[1]^3, ar[2, 1]]/15360 +
       37 Diag[h[1]^5, ar[1, 2]]/4644864 + 13 Diag[h[1]^5, ar[2, 1]]/1161216 + 5/96 Diag[h[2], ar[1, 2]] +
       1/32 Diag[h[2], ar[2, 1]] - 169 Diag[h[1]^2 h[2], ar[1, 2]]/138240 -
       187 Diag[h[1]^2 h[2], ar[2, 1]]/138240 + 1279 Diag[h[1]^4 h[2], ar[1, 2]]/34836480 +
       2669 Diag[h[1]^4 h[2], ar[2, 1]]/69672960 - 187 Diag[h[1] h[2]^2, ar[1, 2]]/138240 -
       169 Diag[h[1] h[2]^2, ar[2, 1]]/138240 + 125 Diag[h[1]^3 h[2]^2, ar[1, 2]]/1741824 +
       2539 Diag[h[1]^3 h[2]^2, ar[2, 1]]/34836480 - 11 Diag[h[2]^3, ar[1, 2]]/15360 - 19 Diag[h[2]^3, ar[2, 1]]/46080 +
       2539 Diag[h[1]^2 h[2]^3, ar[1, 2]]/34836480 + 125 Diag[h[1]^2 h[2]^3, ar[2, 1]]/1741824 +
       2669 Diag[h[1] h[2]^4, ar[1, 2]]/69672960 + 1279 Diag[h[1] h[2]^4, ar[2, 1]]/34836480 +
       13 Diag[h[2]^5, ar[1, 2]]/1161216 + 37 Diag[h[2]^5, ar[2, 1]]/4644864 /. {
  Diag[_, ar[2, 1]] → 0,
  Diag[hs_, ar[1, 2]] :> hs
 }
```

$$-\frac{1}{4} + \frac{h[1]}{32} - \frac{19\,h[1]^3}{46080} + \frac{37\,h[1]^5}{4644864} + \frac{5\,h[2]}{96} - \frac{169\,h[1]^2\,h[2]}{138240} + \frac{1279\,h[1]^4\,h[2]}{34836480} - \frac{187\,h[1]\,h[2]^2}{138240} +$$
$$\frac{125\,h[1]^3\,h[2]^2}{1741824} - \frac{11\,h[2]^3}{15360} + \frac{2539\,h[1]^2\,h[2]^3}{34836480} + \frac{2669\,h[1]\,h[2]^4}{69672960} + \frac{13\,h[2]^5}{1161216}$$

```
cs = {19 / 46080, 169 / 138240, 187 / 138240, 11 / 15360}
```

$$\left\{ \frac{19}{46080}, \frac{169}{138240}, \frac{187}{138240}, \frac{11}{15360} \right\}$$

138 240 cs

{57, 169, 187, 99}

GCD @@ (138 240 cs)

1

Expand[4 pol]

$-1 + \dfrac{h[1]}{8} - \dfrac{19\,h[1]^3}{11\,520} + \dfrac{37\,h[1]^5}{1\,161\,216} + \dfrac{5\,h[2]}{24} - \dfrac{169\,h[1]^2\,h[2]}{34\,560} + \dfrac{1279\,h[1]^4\,h[2]}{8\,709\,120} - \dfrac{187\,h[1]\,h[2]^2}{34\,560} +$

$\dfrac{125\,h[1]^3\,h[2]^2}{435\,456} - \dfrac{11\,h[2]^3}{3840} + \dfrac{2539\,h[1]^2\,h[2]^3}{8\,709\,120} + \dfrac{2669\,h[1]\,h[2]^4}{17\,418\,240} + \dfrac{13\,h[2]^5}{290\,304}$

cs1 = Table[Coefficient[4 * 17 418 240 * pol, h[1] ^ (5 - k) h[2]^k], {k, 0, 5}]

{555, 2558, 5000, 5078, 2669, 780}

(Alt) In[1]:= **ser = 1 + $\left(-\dfrac{x}{8} - \dfrac{5\,y}{24}\right)$ h + $\dfrac{\left(57\,x^3 + 169\,x^2\,y + 187\,x\,y^2 + 99\,y^3\right)\,h^3}{34\,560}$ +**

$\dfrac{1}{17\,418\,240}\left(-555\,x^5 - 2558\,x^4\,y - 5000\,x^3\,y^2 - 5078\,x^2\,y^3 - 2669\,x\,y^4 - 780\,y^5\right)\,h^5 +$

$\dfrac{1}{50\,164\,531\,200}\left(31\,989\,x^7 + 205\,357\,x^6\,y + 592\,097\,x^5\,y^2 +\right.$

$\left.964\,985\,x^4\,y^3 + 949\,967\,x^3\,y^4 + 565\,943\,x^2\,y^5 + 186\,139\,x\,y^6 + 34\,275\,y^7\right)\,h^7 +$

$\dfrac{1}{397\,303\,087\,104\,000}\left(-5\,104\,911\,x^9 - 42\,750\,073\,x^8\,y - 165\,124\,408\,x^7\,y^2 -\right.$

$376\,113\,312\,x^6\,y^3 - 552\,802\,446\,x^5\,y^4 - 542\,218\,746\,x^4\,y^5 - 352\,835\,712\,x^3\,y^6 -$

$\left.146\,191\,048\,x^2\,y^7 - 33\,851\,563\,x\,y^8 - 4\,104\,741\,y^9\right)\,h^9 + O[h]^{10}$

(Alt) Out[1]= $1 + \left(-\dfrac{x}{8} - \dfrac{5\,y}{24}\right)$ h + $\dfrac{\left(57\,x^3 + 169\,x^2\,y + 187\,x\,y^2 + 99\,y^3\right)\,h^3}{34\,560}$ + $\dfrac{1}{17\,418\,240}$

$\left(-555\,x^5 - 2558\,x^4\,y - 5000\,x^3\,y^2 - 5078\,x^2\,y^3 - 2669\,x\,y^4 - 780\,y^5\right)\,h^5 +$

$\dfrac{1}{50\,164\,531\,200}\left(31\,989\,x^7 + 205\,357\,x^6\,y + 592\,097\,x^5\,y^2 +\right.$

$\left.964\,985\,x^4\,y^3 + 949\,967\,x^3\,y^4 + 565\,943\,x^2\,y^5 + 186\,139\,x\,y^6 + 34\,275\,y^7\right)\,h^7 +$

$\dfrac{1}{397\,303\,087\,104\,000}\left(-5\,104\,911\,x^9 - 42\,750\,073\,x^8\,y - 165\,124\,408\,x^7\,y^2 -\right.$

$376\,113\,312\,x^6\,y^3 - 552\,802\,446\,x^5\,y^4 - 542\,218\,746\,x^4\,y^5 - 352\,835\,712\,x^3\,y^6 -$

$\left.146\,191\,048\,x^2\,y^7 - 33\,851\,563\,x\,y^8 - 4\,104\,741\,y^9\right)\,h^9 + O[h]^{10}$

FindSequenceFunction[{24, 34 560, 17 418 240}]

FindSequenceFunction[{24, 34 560, 17 418 240}]

(Alt) In[2]:= **ser /. {x | y → 1}**

(Alt) Out[2]= $1 - \dfrac{h}{3} + \dfrac{2\,h^3}{135} - \dfrac{13\,h^5}{13\,608} + \dfrac{431\,h^7}{6\,123\,600} - \dfrac{27\,113\,h^9}{4\,849\,891\,200} + O[h]^{10}$

(Alt) In[3]:= **FindSequenceFunction[{1 / 3, -2 / 135, 13 / 13 608, -431 / 6 123 600, 27 113 / 4 849 891 200}]**

(Alt) Out[3]= FindSequenceFunction$\left[\left\{\dfrac{1}{3}, -\dfrac{2}{135}, \dfrac{13}{13\,608}, -\dfrac{431}{6\,123\,600}, \dfrac{27\,113}{4\,849\,891\,200}\right\}\right]$

(Alt) In[4]:= **ser /. {x → 1, y → -1}**

(Alt) Out[4]= $1 + \dfrac{h}{12} - \dfrac{h^3}{1440} + \dfrac{h^5}{90\,720} - \dfrac{h^7}{4\,838\,400} + \dfrac{h^9}{239\,500\,800} + O[h]^{10}$

(Alt) In[5]:= **FindSequenceFunction[{12, 1440, 90720, 4838400, 239500800}]**

(Alt) Out[5]= FindSequenceFunction[{12, 1440, 90\,720, 4\,838\,400, 239\,500\,800}]

Google finds 12, 1440, 90720, 4838400, 239500800 !

(Alt) In[9]:= **{24 / 12, 34560 / 1440, 17418240 / 90720,**
50164531200 / 4838400, 397303087104000 / 239500800}

(Alt) Out[9]= {2, 24, 192, 10\,368, 1\,658\,880}

(Alt) In[10]:= **FactorInteger[{2, 24, 192, 10368, 1658880}]**

(Alt) Out[10]= {{{2, 1}}, {{2, 3}, {3, 1}}, {{2, 6}, {3, 1}}, {{2, 7}, {3, 4}}, {{2, 12}, {3, 4}, {5, 1}}}

(Alt) In[12]:= **FactorInteger[{2, 24, 192, 10368, 1658880} / Range[5]!]**

(Alt) Out[12]= {{{2, 1}}, {{2, 2}, {3, 1}}, {{2, 5}}, {{2, 4}, {3, 3}}, {{2, 9}, {3, 3}}}

(Alt) In[14]:= **Simplify[ser /. {x → (a + b) / 2, y → (a - b) / 2}]**

(Alt) Out[14]= $1 + \dfrac{1}{24}\,(-4\,a + b)\,h + \dfrac{\left(64\,a^3 - 18\,a^2\,b + 14\,a\,b^2 - 3\,b^3\right)\,h^3}{34\,560} +$

$\dfrac{\left(-1040\,a^5 + 96\,a^4\,b - 228\,a^3\,b^2 + 117\,a^2\,b^3 - 67\,a\,b^4 + 12\,b^5\right)\,h^5}{34\,836\,480} + \dfrac{1}{50\,164\,531\,200}$

$\left(27\,584\,a^7 + 1356\,a^6\,b + 2564\,a^5\,b^2 - 1248\,a^4\,b^3 + 2472\,a^3\,b^4 - 1170\,a^2\,b^5 + 512\,a\,b^6 - 81\,b^7\right)\,h^7 +$

$\dfrac{1}{397\,303\,087\,104\,000}\left(-4\,338\,080\,a^9 - 481\,200\,a^8\,b + 50\,744\,a^7\,b^2 - 204\,330\,a^6\,b^3 - 138\,390\,a^5\,b^4 +\right.$

$\left.118\,080\,a^4\,b^5 - 156\,782\,a^3\,b^6 + 64\,125\,a^2\,b^7 - 22\,318\,a\,b^8 + 3240\,b^9\right)\,h^9 + O[h]^{10}$