

Experimental Feature

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Experimental Feature

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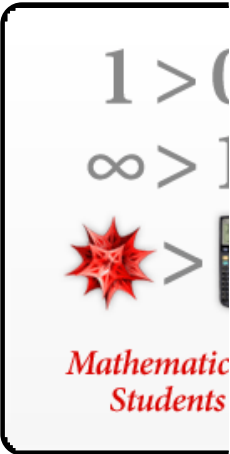
sum binomial(n,m) \* (-1)^m / (m+a)^6 for m from 0 to n

Examples    Random

Sum:

$$\sum_{m=0}^n \frac{(-1)^m \binom{n}{m}}{(a+m)^6} = \frac{1}{120 \Gamma(a+n+1)} \Gamma(a) \Gamma(n+1)$$

$$\begin{aligned} & (5 \psi^{(0)}(a)^4 \psi^{(0)}(a+n+1) - 10 \psi^{(0)}(a)^3 \psi^{(0)}(a+n+1)^2 + \\ & 10 \psi^{(0)}(a)^3 \psi^{(1)}(a+n+1) + 10 \psi^{(0)}(a)^2 \psi^{(0)}(a+n+1)^3 + 30 \psi^{(1)}(a) \\ & \psi^{(0)}(a)^2 \psi^{(0)}(a+n+1) - 30 \psi^{(0)}(a)^2 \psi^{(0)}(a+n+1) \psi^{(1)}(a+n+1) + \\ & 10 \psi^{(0)}(a)^2 \psi^{(2)}(a+n+1) - 5 \psi^{(0)}(a) \psi^{(0)}(a+n+1)^4 - \\ & 15 \psi^{(0)}(a) \psi^{(1)}(a+n+1)^2 - 30 \psi^{(1)}(a) \psi^{(0)}(a) \psi^{(0)}(a+n+1)^2 + \\ & 30 \psi^{(0)}(a) \psi^{(0)}(a+n+1)^2 \psi^{(1)}(a+n+1) + \\ & 30 \psi^{(1)}(a) \psi^{(0)}(a) \psi^{(1)}(a+n+1) + 20 \psi^{(2)}(a) \psi^{(0)}(a) \psi^{(0)}(a+n+1) - \\ & 20 \psi^{(0)}(a) \psi^{(0)}(a+n+1) \psi^{(2)}(a+n+1) + \\ & 5 \psi^{(0)}(a) \psi^{(3)}(a+n+1) + \psi^{(0)}(a+n+1)^5 + \\ & 15 \psi^{(1)}(a)^2 \psi^{(0)}(a+n+1) + 15 \psi^{(0)}(a+n+1) \psi^{(1)}(a+n+1)^2 + \\ & 10 \psi^{(1)}(a) \psi^{(0)}(a+n+1)^3 - 10 \psi^{(0)}(a+n+1)^3 \psi^{(1)}(a+n+1) - \\ & 30 \psi^{(1)}(a) \psi^{(0)}(a+n+1) \psi^{(1)}(a+n+1) - 10 \psi^{(2)}(a) \psi^{(0)}(a+n+1)^2 + \\ & 10 \psi^{(2)}(a) \psi^{(1)}(a+n+1) + 10 \psi^{(0)}(a+n+1)^2 \psi^{(2)}(a+n+1) + \\ & 10 \psi^{(1)}(a) \psi^{(2)}(a+n+1) - 10 \psi^{(1)}(a+n+1) \psi^{(2)}(a+n+1) + \\ & 5 \psi^{(3)}(a) \psi^{(0)}(a+n+1) - 5 \psi^{(0)}(a+n+1) \psi^{(3)}(a+n+1) + \\ & \psi^{(4)}(a+n+1) - \psi^{(0)}(a)^5 - 10 \psi^{(1)}(a) \psi^{(0)}(a)^3 - 10 \psi^{(2)}(a) \psi^{(0)}(a)^2 - \\ & 15 \psi^{(1)}(a)^2 \psi^{(0)}(a) - 5 \psi^{(3)}(a) \psi^{(0)}(a) - 10 \psi^{(1)}(a) \psi^{(2)}(a) - \psi^{(4)}(a) \end{aligned}$$



- Related Wolfram|Alpha C
- series (binomial(n, )
  - integrate (binomial(
  - plot (binomial(n, m)

$\binom{n}{m}$  is the binomial coefficient »

$\Gamma(x)$  is the gamma function »

$\psi^{(n)}(x)$  is the  $n^{\text{th}}$  derivative of the digamma function »

Related Links

Binomial coefficients (Wolfram Functions Site) »

Gamma function (Wolfram Functions Site) »

Polygamma function (Wolfram Functions Site) »

[More »](#)

Alternate forms:

[More](#)

$$\frac{1}{120 a (a+n)!} a! n! (5 \psi^{(0)}(a)^4 \psi^{(0)}(a+n+1) - 10 \psi^{(0)}(a)^3 (\psi^{(0)}(a+n+1)^2 - \psi^{(1)}(a+n+1) + \psi^{(1)}(a)) + 10 \psi^{(0)}(a)^2 (\psi^{(0)}(a+n+1)^3 + 3 (\psi^{(1)}(a) - \psi^{(1)}(a+n+1)) \psi^{(0)}(a+n+1) + \psi^{(2)}(a+n+1) - \psi^{(2)}(a)) - 5 \psi^{(0)}(a) (\psi^{(0)}(a+n+1)^4 + 6 (\psi^{(1)}(a) - \psi^{(1)}(a+n+1)) \psi^{(0)}(a+n+1)^2 - 4 (\psi^{(2)}(a) - \psi^{(2)}(a+n+1)) \psi^{(0)}(a+n+1) + 3 \psi^{(1)}(a+n+1)^2 - 6 \psi^{(1)}(a) \psi^{(1)}(a+n+1) - \psi^{(3)}(a+n+1) + 3 \psi^{(1)}(a)^2 + \psi^{(3)}(a)) + \psi^{(0)}(a+n+1)^5 + 10 \psi^{(0)}(a+n+1)^3 (\psi^{(1)}(a) - \psi^{(1)}(a+n+1)) - 10 \psi^{(0)}(a+n+1)^2 (\psi^{(2)}(a) - \psi^{(2)}(a+n+1)) - 10 \psi^{(1)}(a) (\psi^{(2)}(a) - \psi^{(2)}(a+n+1)) + 10 \psi^{(1)}(a+n+1) (\psi^{(2)}(a) - \psi^{(2)}(a+n+1)) + 5 \psi^{(0)}(a+n+1) (-6 \psi^{(1)}(a) \psi^{(1)}(a+n+1) + 3 \psi^{(1)}(a+n+1)^2 - \psi^{(3)}(a+n+1) + 3 \psi^{(1)}(a)^2 + \psi^{(3)}(a)) + \psi^{(4)}(a+n+1) - \psi^{(0)}(a)^5 - \psi^{(4)}(a))$$

$$- \frac{1}{120 \Gamma(a+n+1)} \Gamma(a) \Gamma(n+1) (-5 \psi^{(0)}(a)^4 \psi^{(0)}(a+n+1) + 10 \psi^{(0)}(a)^3 (\psi^{(0)}(a+n+1)^2 - \psi^{(1)}(a+n+1) + \psi^{(1)}(a)) - 10 \psi^{(0)}(a)^2 (\psi^{(0)}(a+n+1)^3 + 3 (\psi^{(1)}(a) - \psi^{(1)}(a+n+1)) \psi^{(0)}(a+n+1) + \psi^{(2)}(a+n+1) - \psi^{(2)}(a)) + 5 \psi^{(0)}(a) (\psi^{(0)}(a+n+1)^4 + 6 (\psi^{(1)}(a) - \psi^{(1)}(a+n+1)) \psi^{(0)}(a+n+1)^2 - 4 (\psi^{(2)}(a) - \psi^{(2)}(a+n+1)) \psi^{(0)}(a+n+1) + 3 \psi^{(1)}(a+n+1)^2 - 6 \psi^{(1)}(a) \psi^{(1)}(a+n+1) - \psi^{(3)}(a+n+1) + 3 \psi^{(1)}(a)^2 + \psi^{(3)}(a)) - \psi^{(0)}(a+n+1)^5 - 10 \psi^{(0)}(a+n+1)^3 (\psi^{(1)}(a) - \psi^{(1)}(a+n+1)) - 10 \psi^{(2)}(a) \psi^{(1)}(a+n+1) + 10 \psi^{(0)}(a+n+1)^2 (\psi^{(2)}(a) - \psi^{(2)}(a+n+1)) - 10 \psi^{(1)}(a) \psi^{(2)}(a+n+1) + 10 \psi^{(1)}(a+n+1) \psi^{(2)}(a+n+1) - 5 \psi^{(0)}(a+n+1) (-6 \psi^{(1)}(a) \psi^{(1)}(a+n+1) + 3 \psi^{(1)}(a+n+1)^2 - \psi^{(3)}(a+n+1) + 3 \psi^{(1)}(a)^2 + \psi^{(3)}(a)) - \psi^{(4)}(a+n+1) + \psi^{(0)}(a)^5 + 10 \psi^{(1)}(a) \psi^{(2)}(a) + \psi^{(4)}(a))$$

$$\begin{aligned}
& \frac{1}{(a+n)!} (a-1)! n! \\
& \left( \psi^{(0)}(a)^3 \left( -\frac{1}{12} \psi^{(0)}(a+n+1)^2 + \frac{1}{12} \psi^{(1)}(a+n+1) - \frac{\psi^{(1)}(a)}{12} \right) + \right. \\
& \quad \psi^{(0)}(a)^2 \left( \frac{1}{12} \psi^{(0)}(a+n+1)^3 + \left( \frac{\psi^{(1)}(a)}{4} - \frac{1}{4} \psi^{(1)}(a+n+1) \right) \right. \\
& \quad \quad \left. \psi^{(0)}(a+n+1) + \frac{1}{12} \psi^{(2)}(a+n+1) - \frac{\psi^{(2)}(a)}{12} \right) + \\
& \quad \psi^{(0)}(a) \left( -\frac{1}{24} \psi^{(0)}(a+n+1)^4 + \left( \frac{1}{4} \psi^{(1)}(a+n+1) - \frac{\psi^{(1)}(a)}{4} \right) \right. \\
& \quad \quad \left. \psi^{(0)}(a+n+1)^2 + \left( \frac{\psi^{(2)}(a)}{6} - \frac{1}{6} \psi^{(2)}(a+n+1) \right) \psi^{(0)}(a+n+1) - \right. \\
& \quad \quad \left. \frac{1}{8} \psi^{(1)}(a+n+1)^2 + \frac{1}{4} \psi^{(1)}(a) \psi^{(1)}(a+n+1) + \right. \\
& \quad \quad \left. \frac{1}{24} \psi^{(3)}(a+n+1) - \frac{\psi^{(1)}(a)^2}{8} - \frac{\psi^{(3)}(a)}{24} \right) + \\
& \quad \frac{1}{120} \psi^{(0)}(a+n+1)^5 + \psi^{(0)}(a+n+1)^3 \left( \frac{\psi^{(1)}(a)}{12} - \frac{1}{12} \psi^{(1)}(a+n+1) \right) + \\
& \quad \psi^{(1)}(a+n+1) \left( \frac{\psi^{(2)}(a)}{12} - \frac{1}{12} \psi^{(2)}(a+n+1) \right) + \\
& \quad \left( \psi^{(0)}(a+n+1)^2 + \psi^{(1)}(a) \right) \left( \frac{1}{12} \psi^{(2)}(a+n+1) - \frac{\psi^{(2)}(a)}{12} \right) + \\
& \quad \psi^{(0)}(a+n+1) \left( \frac{1}{8} \psi^{(1)}(a+n+1)^2 - \frac{1}{4} \psi^{(1)}(a) \psi^{(1)}(a+n+1) - \right. \\
& \quad \quad \left. \frac{1}{24} \psi^{(3)}(a+n+1) + \frac{\psi^{(0)}(a)^4}{24} + \frac{\psi^{(1)}(a)^2}{8} + \frac{\psi^{(3)}(a)}{24} \right) + \\
& \quad \left. \frac{1}{120} \psi^{(4)}(a+n+1) - \frac{\psi^{(0)}(a)^5}{120} - \frac{\psi^{(4)}(a)}{120} \right)
\end{aligned}$$

$n!$  is the factorial function >

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