

```
Clear[Dz]
Dz[n_, z_, k_] := Dz[n, z, k] = 1 + ((z + 1) / k - 1) Sum[Dz[Floor[n / j], z, k + 1], {j, 2, n}]
```

```
Expand@Dz[100, z a, 1]
```

$$1 + \frac{428 a z}{15} + \frac{16289 a^2 z^2}{360} + \frac{331 a^3 z^3}{16} + \frac{611 a^4 z^4}{144} + \frac{67 a^5 z^5}{240} + \frac{7 a^6 z^6}{720}$$

```
D[Expand@Dz[100, z, 1], z] /. z -> 0
```

$$\frac{428}{15}$$

```
D[Expand@Dz[100, z a, 1], z] /. z -> 0
```

$$\frac{428 a}{15}$$

```
D[x^ (a z), z] /. z -> 0
```

```
a Log[x]
```

```
N[D[LaguerreL[- (a z), Log[200]], z] /. z -> 0]
```

```
47.9476 a
```

```
ff[n_, z_] := LaguerreL[-z, Log[n]]
```

```
fg[n_, z_] := n^z
```

```
fh[n_, z_] := (-1)^z Gamma[z, 0, -Log[n]] / Gamma[z]
```

```
Sum[ (-1)^(k+1) fh[k, -1], {k, 1, Infinity}]
```

Infinity::indet: Indeterminate expression 0 ComplexInfinity encountered. >>

Sum::div: Sum does not converge. >>

$$\sum_{k=1}^{\infty} \text{Indeterminate}$$

```
N@Sum[ (-1)^(k+1) fg[k, -3], {k, 1, Infinity}]
```

```
0.901543
```

```
Expand[FullSimplify[n / ((m + 1) ((x - 1) / (n - 1)) + 1)]]
```

$$-\frac{n}{-2 + n + m(-1 + x) + x} + \frac{n^2}{-2 + n + m(-1 + x) + x}$$

```
FullSimplify@Log[n, n^(1/2)]
```

$$\frac{1}{2}$$

```
E^(Log[j] / Log[n])
```

$$j^{\frac{1}{\text{Log}[n]}}$$

```
Table[ If[ Log[j] / Log[12] + Log[k] / Log[12] ≤ 1, 1, 0], {j, 1, 16}, {k, 1, 16}] // TableForm
```

1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0
1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



```
Table[ If[ N[j k] ≤ 12, 1, 0], {j, 1, 16}, {k, 1, 16}] // TableForm
```

1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0
1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

```
E^((Log[j] + Log[k]) / Log[n]) /. {n → 30, k → 2, j → 3}
```

$$e^{\frac{\log(2) + \log(3)}{\log(30)}}$$

```
E^((Log[j k]) / Log[n]) /. {n → 30, k → 2, j → 3}
```

$$6^{\frac{1}{\log(30)}}$$

```
N[Log[n, n] - Log[n, j] /. {n → 30, j → 5}]
```

```
0.526803
```

```
N[Log[n, n / j] /. {n → 30, j → 5}]
```

```
0.526803
```

```
Log[n, n / j]
```

$$\frac{\log\left[\frac{n}{j}\right]}{\log[n]}$$

$m^{\text{Log}[m, k]}$

$k$

$\text{N}[\text{FullSimplify}[m^{\text{Log}[n, n/j]}] /. \{n \rightarrow 30, j \rightarrow 3, m \rightarrow 40\}]$

12.1502

$\text{N}[m^{(1 - \text{Log}[j] / \text{Log}[n])}] /. \{n \rightarrow 30, j \rightarrow 3, m \rightarrow 40\}]$

12.1502

$m * m^{(-\text{Log}[j] / \text{Log}[n])}$

$m^{1 - \frac{\text{Log}[j]}{\text{Log}[n]}}$

$\text{Log}[x, 1]$

0

$\text{Integrate}[\text{D}[\text{LaguerreL}[-1, \text{Log}[x]], x] \text{D}[\text{LaguerreL}[-1, \text{Log}[y]], y], \{x, 1, n\}, \{y, 1, m^{(1 - \text{Log}[n, x])}\}]$

$\text{ConditionalExpression}\left[\frac{\text{Log}[m] - n \text{Log}[m] - \text{Log}[n] + m \text{Log}[n]}{\text{Log}[m] - \text{Log}[n]}, \text{Re}[n] \geq 0 \mid \mid n \notin \text{Reals}\right]$

$\text{FullSimplify}\left[\frac{\text{Log}[m] - n \text{Log}[m] - \text{Log}[n] + m \text{Log}[n]}{\text{Log}[m] - \text{Log}[n]}\right]$

$\frac{-(-1 + n) \text{Log}[m] + (-1 + m) \text{Log}[n]}{\text{Log}[m] - \text{Log}[n]}$

$\text{Integrate}[\text{D}[\text{LaguerreL}[-1, \text{Log}[x]], x], \{x, 1, n\}]$

$-1 + n$

$\text{Integrate}[\text{D}[\text{LaguerreL}[-1, \text{Log}[x]], x], \{x, 1, m\}]$

$-1 + m$

$\text{FullSimplify}\left[\frac{\text{Log}[m] - n \text{Log}[m] - \text{Log}[n] + m \text{Log}[n]}{\text{Log}[m] - \text{Log}[n]} + (-1 + n) + (-1 + m) + 1\right]$

$\frac{m \text{Log}[m] - n \text{Log}[n]}{\text{Log}[m] - \text{Log}[n]}$

$\text{N}[\text{LaguerreL}[-1, \text{Log}[m]] /. \{m \rightarrow 8, n \rightarrow 7\}]$

8.

$\frac{m \text{Log}[m] - n \text{Log}[n]}{\text{Log}[m] - \text{Log}[n]} /. \{m \rightarrow 8, n \rightarrow 7\}$

$\frac{-7 \text{Log}[7] + 8 \text{Log}[8]}{-\text{Log}[7] + \text{Log}[8]}$

$\text{FullSimplify}[\text{Integrate}[\text{D}[\text{LaguerreL}[-1, \text{Log}[x]], x] \text{D}[\text{LaguerreL}[-1, \text{Log}[y]], y], \{x, 1, n\}, \{y, 1, m^{(1 - \text{Log}[x] / \text{Log}[n])}\}] + \text{Integrate}[\text{D}[\text{LaguerreL}[-1, \text{Log}[x]], x], \{x, 1, n\}] + \text{Integrate}[\text{D}[\text{LaguerreL}[-1, \text{Log}[x]], x], \{x, 1, m\}] + 1]$

$\text{ConditionalExpression}\left[\frac{m \text{Log}[m] - n \text{Log}[n]}{\text{Log}[m] - \text{Log}[n]}, \text{Re}[n] \geq 0 \mid \mid n \notin \text{Reals}\right]$

$\text{N}[\text{D}[\text{LaguerreL}[-1, \text{Log}[n]], n] /. n \rightarrow 6]$

1.

**FullSimplify[Integrate[1, {x, 1, n}, {y, 1, m^(1 - Log[x] / Log[n])}] +  
Integrate[1, {x, 1, n}] + Integrate[1, {x, 1, m}] + 1]**

**ConditionalExpression** $\left[\frac{m \operatorname{Log}[m] - n \operatorname{Log}[n]}{\operatorname{Log}[m] - \operatorname{Log}[n]}, \operatorname{Re}[n] \geq 0 \mid \mid n \notin \operatorname{Reals}\right]$

**Log[m^m / n^n] / Log[m / n]**

$$\frac{\operatorname{Log}[m^m n^{-n}]}{\operatorname{Log}\left[\frac{m}{n}\right]}$$

**N** $\left[\frac{m \operatorname{Log}[m] - n \operatorname{Log}[n]}{\operatorname{Log}[m] - \operatorname{Log}[n]}\right] /. \{m \rightarrow 9, n \rightarrow 7\}$

24.4859

**N[Log[m^m / n^n] / Log[m / n] /. {m → 9, n → 7}]**

24.4859

**N[Log[m / n, m^m / n^n] /. {m → 9, n → 7}]**

24.4859

**Log[m / n, m^m / n^n]**

$$\frac{\operatorname{Log}[m^m n^{-n}]}{\operatorname{Log}\left[\frac{m}{n}\right]}$$

**Log[9 / 7, 9^9 / 7^7]**

$$\frac{\operatorname{Log}\left[\frac{387420489}{823543}\right]}{\operatorname{Log}\left[\frac{9}{7}\right]}$$

**Log[9 / 7, 9^2 × 9^7 / 7^7]**

$$\frac{\operatorname{Log}\left[\frac{387420489}{823543}\right]}{\operatorname{Log}\left[\frac{9}{7}\right]}$$

**Log[9 / 7, 9^2] + Log[9 / 7, 9^7 / 7^7]**

$$7 + \frac{\operatorname{Log}[81]}{\operatorname{Log}\left[\frac{9}{7}\right]}$$

**N[n + Log[m / n, m^(m - n)] /. {m → 9, n → 7}]**

24.4859

**n + (m - n) Log[m / n, m] /. {m → 9, n → 7}**

$$7 + \frac{2 \operatorname{Log}[9]}{\operatorname{Log}\left[\frac{9}{7}\right]}$$

**N[n + (m - n) (Log[m] / (Log[m] - Log[n])) /. {m → 9, n → 7}]**

24.4859

**N[Log[m^m / n^n] / Log[m / n] /. {m → 9, n → 7}]**

24.4859

$$N[\text{Log}[m^m] / \text{Log}[m/n] - \text{Log}[n^n] / \text{Log}[m/n] /. \{m \rightarrow 9, n \rightarrow 7\}]$$

24.4859

$$N[m \text{Log}[m/n, m] - n \text{Log}[m/n, n] /. \{m \rightarrow 9, n \rightarrow 7\}]$$

24.4859