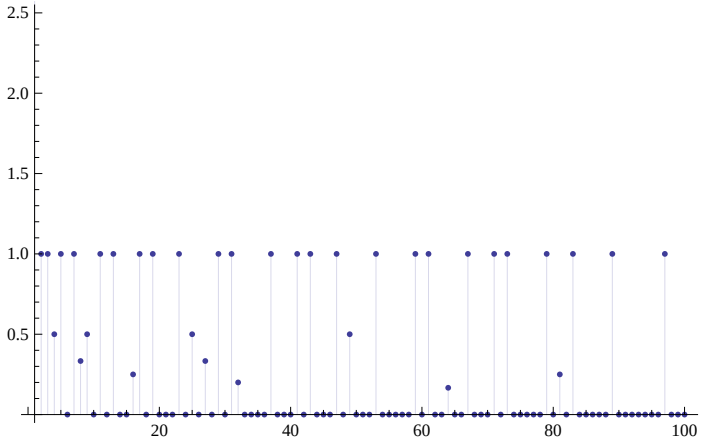
```
d2[n_, k_] := Sum[d2[j, k - 1] d2[n / j, 1], {j, Divisors[n]}];
d2[n_, 1] := 1; d2[1, 1] := 0; d2[n_, 0] := 0; d2[1, 0] := 1
d[n_, z_] := Product[Pochhammer[z, a = p[[2]]] / a!, {p, FI[n]}];
FI[n_] := FactorInteger[n]; FI[1] := {}
DD[n_, k_] := Sum[d[j, k], {j, 1, n}]

dw[x_, a_] := Sum[ Gamma[a + 1] / (Gamma[a - k + 1] Gamma[k + 1] ) d2[x, k], {k, 0, Log[2, x]}]
dwk[x_, a_, k_] := Gamma[a + 1] / (Gamma[a - k + 1] Gamma[k + 1] ) d2[x, k]


dw[7, 5]
```

5

```
DiscretePlot[ dw[n, .0001] / .0001, {n, 1, 100}]
```




```
Gamma[.0001 + 1] / (Gamma[.0001 - 2 + 1] Gamma[2 + 1] ) d2[30, 2]
```

-0.00029997

```
0!
```

1

```
Expand[(b!) / ((k!) (b - k)!) / k]
```

$$\frac{b!}{k\,(b-k)!\,k!}$$

```
FE[b_, k_ ] := Gamma[b + 1] / (Gamma[b - k + 1] Gamma[k + 1] ) / k
FE[3, 0]
```

Power::infy : Infinite expression $\frac{1}{0}$ encountered. >>

ComplexInfinity

```
Limit[FE[3, x], x → 0]
```

∞

```
Expand[Gamma[b - k + 1] k]
```

k Gamma[1 + b - k]

```
FullSimplify[z (z - 1) (z - 2) (z - 3) / z!]
```

$$\frac{1}{\text{Gamma}[-3+z]}$$

```
N[1 / Gamma[-3]]
```

```
0.
```

```
Limit[(z - 1) / z!, {z → 0}]
```

```
{-1}
```

```
Limit[(z - 1) (z - 2) / z!, {z → 0}]
```

```
{2}
```

```
Limit[(z - 1) (z - 2) (z - 3) / z!, {z → 0}]
```

```
{-6}
```

```
Limit[(z - 1) (z - 2) (z - 3) (z - 4) / z!, {z → 0}]
```

```
{24}
```

```
zz[x_] := Log[x]
```

```
zz'[x]
```

$$\frac{1}{x}$$

```
Series[1 / (x + 1), {x, 0, 16}]
```

$$1 - x + x^2 - x^3 + x^4 - x^5 + x^6 - x^7 + x^8 - x^9 + x^{10} - x^{11} + x^{12} - x^{13} + x^{14} - x^{15} + x^{16} + O[x]^{17}$$

```
zz[x_] := 1 - x + x^2 - x^3 + x^4 - x^5 + x^6 - x^7 + x^8 - x^9 + x^10 - x^11 + x^12 - x^13 + x^14 - x^15 + x^16
```

```
Integrate[ zz[n], {n, 1, x}]
```

$$-\frac{1\,768\,477}{2\,450\,448} + x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \frac{x^5}{5} - \frac{x^6}{6} + \frac{x^7}{7} - \frac{x^8}{8} + \frac{x^9}{9} - \frac{x^{10}}{10} + \frac{x^{11}}{11} - \frac{x^{12}}{12} + \frac{x^{13}}{13} - \frac{x^{14}}{14} + \frac{x^{15}}{15} - \frac{x^{16}}{16} + \frac{x^{17}}{17}$$

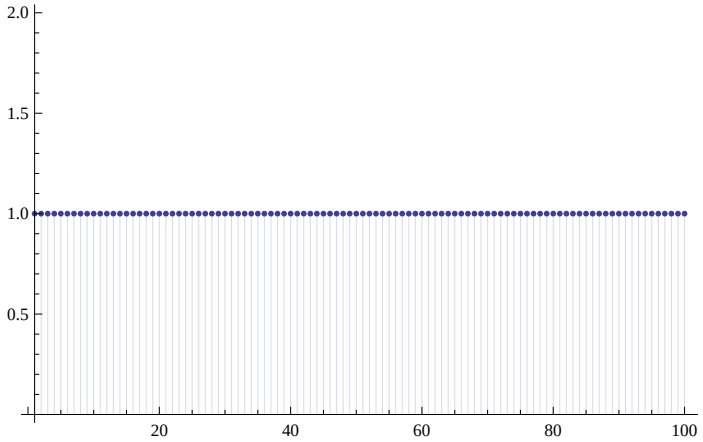
```
Mert[n_] := Sum[MoebiusMu[j], {j, 1, n}]
```

```
Mert[100]
```

```
1
```

```
MSum[n_] := Sum[ Mert[Floor[n / j]], {j, 1, n}]
```

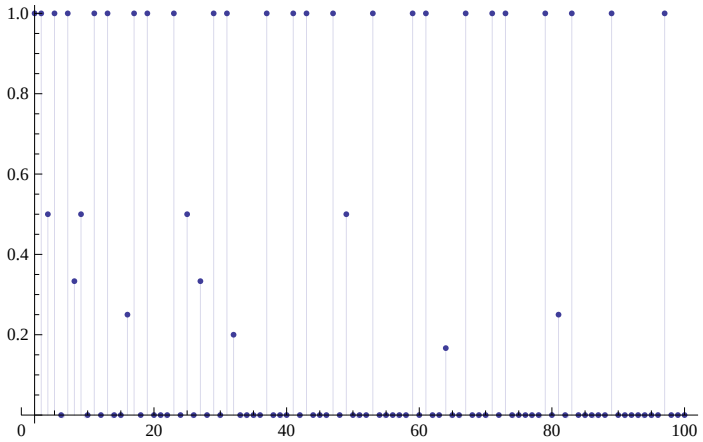
```
DiscretePlot[ MSum[n], {n, 1, 100}]
```




```
cc = -.00000000001
bb[n_] := Sum[ d[ j, -1 + cc ] / cc, {j, Divisors[n]}]
```

$-1.\times 10^{-11}$

```
DiscretePlot[ bb[n], {n, 2, 100}]
```




```
d[100, -1]
```

0

```
1 + 1 + 1 + 1 + 4 + .5 + 4 + 1 + 1 + 2 + 1.25 + 4 + 2 + 1 + 1.5 + 1 + 3 + 1 + 1.5 + 1.5 + 2
```

36.25

```
aaa = -.000000000001
bbb = 100 000 000 000
mm[n_] := (Sum[Mertens[n / j] d[ j, 1 + 1 / bbb ], {j, 1, n}] - 1) * bbb
mm2[n_] := (Sum[DD[n / j, -1 + 1 / bbb], {j, 1, n}] - 1) * bbb
Mertens[n_] := Sum[ MoebiusMu[j], {j, 1, n}]
```

$-1.\times 10^{-12}$

100 000 000 000

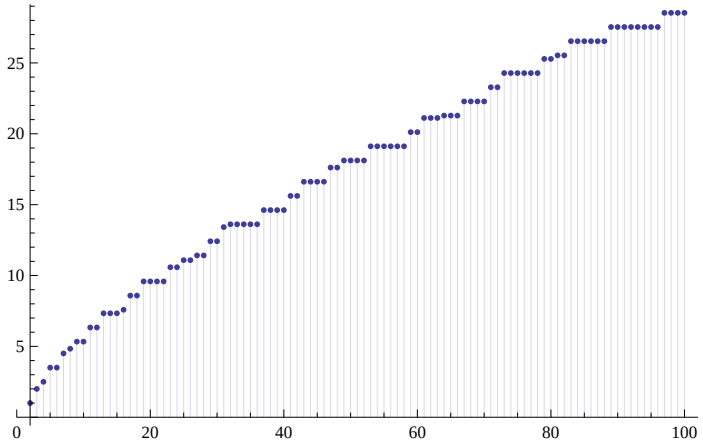
```
N[mm[100]]
```

28.5333

```
N[mm2[100]]
```

```
DiscretePlot[ mm2[n], {n, 2, 100}]
```

28.5333




```
d[10, 1 + 10^-20] / 10^-20
```

$$\frac{10\,000\,000\,000\,000\,000\,000\,200\,000\,000\,000\,000\,000\,001}{100\,000\,000\,000\,000\,000\,000}$$

```
Limit[ 1 / x^z - 1
```

```
FF[x_] := x^0 / 0! P0 + x^1 / 1! P1 + x^2 / 2! P2 + x^3 / 3! P3 +
  x^4 / 4! P4 + x^5 / 5! P5 + x^6 / 6! P6 + x^7 / 7! P7 + x^8 / 8! P8 + x^9 / 9! P9
```

```
Derivative[2][FF] /. #1 → x
```

$$P2 + P3\,x + \frac{P4\,x^2}{2} + \frac{P5\,x^3}{6} + \frac{P6\,x^4}{24} + \frac{P7\,x^5}{120} + \frac{P8\,x^6}{720} + \frac{P9\,x^7}{5040} \&$$

```
Dwh[x_, a_] := Sum[ Gamma[a + 1] / (Gamma[a - k + 1] Gamma[k + 1] ) Dhyp[x, k], {k, 0, Log[2, x]}]
```

```
Dwh2[a_] := Dwh[x, a]
```

```
Derivative[-1][Dwh2] /. #1 → a
```

$Dwh2^{(-1)}$

```
FE[n_] := Sum[ d[j, aaa] Log[j], {j, 2, n}] / aaa
```

```
FE[100]
```

```
94.0456347612684
```

```
ML[j_, x_ ] := ((j^x - 1) / x) (d[j, x] / x)
```

```
{ML[zz = 6, .00000001], N[MangoldtLambda[zz]]}
```

$\{1.79176 \times 10^{-8}, 0.\}$

```
N[Log[3]]
```

```
1.09861
```

```
FullSimplify[((j^x - 1) / x) (d[j, x] / x)]
```

FactorInteger::exact : Argument j in FactorInteger[j] is not an exact number. ≫

Part::partd : Part specification p⟦2⟧ is longer than depth of object. ≫

FactorInteger::exact : Argument j in FactorInteger[j] is not an exact number. ≫

Part::partd : Part specification p⟦2⟧ is longer than depth of object. ≫

$$\frac{(-1+j^x)\prod_p^{\text{FactorInteger}[j]} \frac{\text{Pochhammer}[x,p[\![2]\!]]}{p[\![2]\!]!}}{x^2}$$