

```
Sum[ 1 / ((3 k - 2) ^ 3), {k, 1, Infinity}]
Sum[ 1 / ((3 k - 1) ^ 3), {k, 1, Infinity}]
Sum[ 1 / ((3 k - 0) ^ 3), {k, 1, Infinity}]
```

$$\frac{1}{243} \left(2 \sqrt{3} \pi^3 + 117 \text{Zeta}[3] \right)$$

$$\frac{1}{243} \left(-2 \sqrt{3} \pi^3 + 117 \text{Zeta}[3] \right)$$

$$\frac{\text{Zeta}[3]}{27}$$

```
Expand[Sum[ 1 / ((3 k - 2) ^ 3), {k, 1, Infinity}] - Sum[ 1 / ((3 k - 1) ^ 3), {k, 1, Infinity}]]
```

$$\frac{4 \pi^3}{81 \sqrt{3}}$$

```
Sum[ 1 / ((6 k - 5) ^ 3), {k, 1, Infinity}]
Sum[ 1 / ((6 k - 4) ^ 3), {k, 1, Infinity}]
Sum[ 1 / ((6 k - 3) ^ 3), {k, 1, Infinity}]
Sum[ 1 / ((6 k - 2) ^ 3), {k, 1, Infinity}]
Sum[ 1 / ((6 k - 1) ^ 3), {k, 1, Infinity}]
Sum[ 1 / ((6 k - 0) ^ 3), {k, 1, Infinity}]
```

$$\frac{1}{216} \left(2 \sqrt{3} \pi^3 + 91 \text{Zeta}[3] \right)$$

$$\frac{2 \sqrt{3} \pi^3 + 117 \text{Zeta}[3]}{1944}$$

$$\frac{7 \text{Zeta}[3]}{216}$$

$$\frac{-2 \sqrt{3} \pi^3 + 117 \text{Zeta}[3]}{1944}$$

$$\frac{1}{216} \left(-2 \sqrt{3} \pi^3 + 91 \text{Zeta}[3] \right)$$

$$\frac{\text{Zeta}[3]}{216}$$

$$\text{FullSimplify} \left[\left(\left(-\frac{1}{250} \text{PolyGamma} \left[2, \frac{2}{5} \right] \right) - \left(-\frac{1}{250} \text{PolyGamma} \left[2, \frac{3}{5} \right] \right) \right) / \pi^3 \right]$$

$$\frac{-\text{PolyGamma} \left[2, \frac{2}{5} \right] + \text{PolyGamma} \left[2, \frac{3}{5} \right]}{250 \pi^3}$$

```

Sum[ 1 / ((9 k - 8) ^ 3), {k, 1, Infinity}]
Sum[ 1 / ((9 k - 7) ^ 3), {k, 1, Infinity}]
Sum[ 1 / ((9 k - 6) ^ 3), {k, 1, Infinity}]
Sum[ 1 / ((9 k - 5) ^ 3), {k, 1, Infinity}]
Sum[ 1 / ((9 k - 4) ^ 3), {k, 1, Infinity}]
Sum[ 1 / ((9 k - 3) ^ 3), {k, 1, Infinity}]
Sum[ 1 / ((9 k - 2) ^ 3), {k, 1, Infinity}]
Sum[ 1 / ((9 k - 1) ^ 3), {k, 1, Infinity}]
Sum[ 1 / ((9 k - 0) ^ 3), {k, 1, Infinity}]

```

$$\begin{aligned}
& - \frac{\text{PolyGamma}\left[2, \frac{1}{9}\right]}{1458} \\
& - \frac{\text{PolyGamma}\left[2, \frac{2}{9}\right]}{1458} \\
& \frac{2 \sqrt{3} \pi^3 + 117 \text{Zeta}[3]}{6561} \\
& - \frac{\text{PolyGamma}\left[2, \frac{4}{9}\right]}{1458} \\
& - \frac{\text{PolyGamma}\left[2, \frac{5}{9}\right]}{1458} \\
& \frac{-2 \sqrt{3} \pi^3 + 117 \text{Zeta}[3]}{6561} \\
& - \frac{\text{PolyGamma}\left[2, \frac{7}{9}\right]}{1458} \\
& - \frac{\text{PolyGamma}\left[2, \frac{8}{9}\right]}{1458} \\
& \frac{\text{Zeta}[3]}{729} \\
& \text{Expand}\left[\text{Sum}\left[\frac{1}{(9k-6)^3}, \{k, 1, \text{Infinity}\}\right] - \text{Sum}\left[\frac{1}{(9k-3)^3}, \{k, 1, \text{Infinity}\}\right]\right] \\
& \frac{4 \pi^3}{2187 \sqrt{3}}
\end{aligned}$$

```

Sum[ 1 / ((12 k - 11) ^ 3), {k, 1, Infinity}]
Sum[ 1 / ((12 k - 10) ^ 3), {k, 1, Infinity}]
Sum[ 1 / ((12 k - 9) ^ 3), {k, 1, Infinity}]
Sum[ 1 / ((12 k - 8) ^ 3), {k, 1, Infinity}]
Sum[ 1 / ((12 k - 7) ^ 3), {k, 1, Infinity}]
Sum[ 1 / ((12 k - 6) ^ 3), {k, 1, Infinity}]
Sum[ 1 / ((12 k - 5) ^ 3), {k, 1, Infinity}]
Sum[ 1 / ((12 k - 4) ^ 3), {k, 1, Infinity}]
Sum[ 1 / ((12 k - 3) ^ 3), {k, 1, Infinity}]
Sum[ 1 / ((12 k - 2) ^ 3), {k, 1, Infinity}]
Sum[ 1 / ((12 k - 1) ^ 3), {k, 1, Infinity}]
Sum[ 1 / ((12 k - 0) ^ 3), {k, 1, Infinity}]

```

$$\begin{aligned}
& - \frac{\text{PolyGamma}\left[2, \frac{1}{12}\right]}{3456} \\
& \frac{2\sqrt{3}\pi^3 + 91\text{Zeta}[3]}{1728} \\
& \frac{\pi^3 + 28\text{Zeta}[3]}{1728} \\
& \frac{2\sqrt{3}\pi^3 + 117\text{Zeta}[3]}{15552} \\
& - \frac{\text{PolyGamma}\left[2, \frac{5}{12}\right]}{3456} \\
& \frac{7\text{Zeta}[3]}{1728} \\
& - \frac{\text{PolyGamma}\left[2, \frac{7}{12}\right]}{3456} \\
& \frac{-2\sqrt{3}\pi^3 + 117\text{Zeta}[3]}{15552} \\
& \frac{-\pi^3 + 28\text{Zeta}[3]}{1728} \\
& \frac{-2\sqrt{3}\pi^3 + 91\text{Zeta}[3]}{1728} \\
& - \frac{\text{PolyGamma}\left[2, \frac{11}{12}\right]}{3456} \\
& \frac{\text{Zeta}[3]}{1728} \\
& \text{Expand}\left[\text{Sum}\left[\frac{1}{(12k-2)^3}, \{k, 1, \text{Infinity}\}\right] - \text{Sum}\left[\frac{1}{(12k-10)^3}, \{k, 1, \text{Infinity}\}\right]\right] \\
& - \frac{\pi^3}{144\sqrt{3}}
\end{aligned}$$

Expand[**Sum**[$1 / ((12 k - 3)^3)$, {**k**, 1, **Infinity**}] - **Sum**[$1 / ((12 k - 9)^3)$, {**k**, 1, **Infinity**}]]

$$-\frac{\pi^3}{864}$$

Expand[**Sum**[$1 / ((12 k - 4)^3)$, {**k**, 1, **Infinity**}] - **Sum**[$1 / ((12 k - 8)^3)$, {**k**, 1, **Infinity**}]]

$$-\frac{\pi^3}{1296 \sqrt{3}}$$