Today's topics and news

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- Topic: Sums and sigmas

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- Topic: Sums and sigmas
- **Homework:** Watch videos 7.3 - 7.5 for Thursday.

Sigma

Recall from (7.2) that $\sum$ is called sigma and is a notation used the denote sum.

Given $n \in \mathbb{N}$ and $a_1, a_2, ...a_n \in \mathbb{R}$, $\sum_{k=1}^{n} a_k = a_1 + a_2 + ... + a_n$.

Sigma

Recall from (7.2) that $\sum$ is called sigma and is a notation used the denote sum.

Given $n \in \mathbb{N}$ and $a_1, a_2, ...a_n \in \mathbb{R}$, $\sum_{k=1}^{n} a_k = a_1 + a_2 + ... + a_n$. Here k is the dummy variable and has no meaning outside of $\sum$.

Define $\forall k \in \mathbb{N}, a_k = 2k + 1$. Compute:

1. $\sum_{k=2}^{4} a_k$.
2. $\sum_{i=2}^{4} a_k$.
3. $\sum_{i=2}^{4} a_i$.

Write these sums with sigma notation

1. $1^5 + 2^5 + 3^5 + 4^5 + \ldots + 100^5$

2. $\dfrac{2}{4^2} + \dfrac{2}{5^2} + \dfrac{2}{6^2} + \dfrac{2}{7^2} + \ldots + \dfrac{2}{N^2}$

3. $\dfrac{1}{1!} - \dfrac{1}{3!} + \dfrac{1}{5!} - \dfrac{1}{7!} + \ldots + \dfrac{1}{81!}$

4. $\dfrac{x^2}{3!} + \dfrac{2x^3}{4!} + \dfrac{3x^4}{5!} + \dfrac{4x^5}{6!} + \ldots + \dfrac{999x^{1000}}{1001!}$

Re-writing sums

1. $$\sum_{i=1}^{100} \tan i - \sum_{i=1}^{50} \tan i = \sum_{???}^{???} ???$$

2. $$\sum_{i=1}^{N} (2i-1)^5 = \sum_{i=0}^{N-1} ???$$

Double sums

Compute:

1. $\sum_{i=1}^{n}(\sum_{k=1}^{n} 1)$
2. $\sum_{i=1}^{n}(\sum_{k=1}^{i} 1)$
3. $\sum_{i=1}^{n}(\sum_{k=1}^{i} i)$
4. $\sum_{i=1}^{n}(\sum_{k=1}^{i} k)$
5. $\sum_{i=1}^{n}(\sum_{k=1}^{i} ik)$

Use the following formulas:

1. $\sum_{k=1}^{n} k = \frac{(n)(n+1)}{2}$
2. $\sum_{k=1}^{n} k^2 = \frac{(n)(n+1)(2n+1)}{6}$
3. $\sum_{k=1}^{n} k^3 = \frac{(n)^2(n+1)^2}{4}$

Sigma notaiton exercise

Consider the sum $15 + 21 + 27 + 33 + \ldots 297 + 303$. Write this in $\sum$ notation.

Sigma notaiton exercise

Consider the sum $15 + 21 + 27 + 33 + ...297 + 303$. Write this in $\sum$ notation.

We have the following formulas:

1. $\sum_{k=1}^{n} 1 = n$
2. $\sum_{k=1}^{n} k = \frac{(n)(n+1)}{2}$
3. $\sum_{k=1}^{n} k^2 = \frac{(n)(n+1)(2n+1)}{6}$

Compute the sum above using these formulas.