Practice:

Write the follow using summation notation.

① $1^3 + 2^3 + 3^3 + \cdots + 56^3$

$$= \sum_{i=1}^{56} i^3$$

② $\frac{1}{1} + \frac{1}{2} + \frac{1}{3} + \cdots + \frac{1}{2025}$

$$= \sum_{i=1}^{2025} \frac{1}{i}$$

③ $\frac{1}{3^2} + \frac{1}{4^2} + \frac{1}{5^2} + \cdots + \frac{1}{20^2}$

$$= \sum_{i=3}^{20} \frac{1}{i^2}$$

④ $2^{(2)} + 2^3 + 2^4 + 2^5 + \cdots + 2^{(19)}$

$$= \sum_{i=2}^{19} 2^i$$

⑤ $x_{(3)}^2 + x_4^2 + x_5^2 + \cdots + x_{(100)}^2$

$$= \sum_{i=3}^{100} x_i^2$$

⊛ Sample Variance formula

Given the sample: $(x_1, x_2, \cdots, x_n)$

The sample variance is

$$\frac{\sum (x_i - \bar{x})^2}{n-1}$$

where $\bar{x} = \frac{\sum x_i}{n}$, which is the sample mean.

⊛ Sample Standard Deviation, S

$$S = \sqrt{\text{sample variance}}$$

OR

$$S = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}}$$

Note: The variance can be denoted by V, Var or s^2

$$\text{Variance} = \frac{\sum (x_i - \bar{x})^2}{n-1}$$

$$= \frac{(x_1 - \bar{x})^2 + (x_2 - \bar{x})^2 + \cdots + (x_n - \bar{x})^2}{n-1}$$