10.1

write sigma notation. $\sum_{i=1}^{n} a_n$

56. $7+14+21+28+35+\ldots$

$$\sum_{i=1}^{\infty} 7i = \sum_{n=1}^{\infty} 7n$$

60. $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+\frac{1}{4^2}+\frac{1}{5^2}$

$$\sum_{i=1}^{5} \frac{1}{i^2} = \sum_{i=1}^{5} i^{-2}$$

62. $9-16+25+\ldots+(-1)^{n+1}n^2$

$a_n=(-1)^{n+1}n^2$

$$\sum_{i=3}^{n} (-1)^{i+1} i^2$$

$-9+16-25+\ldots+(-1)^{n+1}\cdot n^2$

$$\sum_{i=3}^{n} (-1)^{i+2} i^2 \qquad (-1)^{i+1}(-1)^1$$

64.

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

$$\sum_{\text{☺}=1}^{\infty}\frac{1}{\text{☺}(\text{☺}+1)^2}$$

Arithmetic Sequences/Series:

Definition: A sequence is arithmetic if there exists a number d, called the **common difference**, such that $\boldsymbol{a_{n+1} = a_n + d}$ for any integer $n \geq 1$.

The **nth term** of an arithmetic sequence is given by
$\boldsymbol{a_n = a_1 + (n-1)d}$, for any integer $n \geq 1$.

The **sum of the first n terms** of an arithmetic sequence is given by
$$\boldsymbol{S_n = \frac{n}{2}(a_1 + a_n)}$$

Geometric Sequences/Series:

Definition: A sequence is geometric is there is a number r, called the **common ratio**, such that
$\boldsymbol{\frac{a_{n+1}}{a_n} = r}$, or $a_{n+1} = a_n r$, for any integer $n \geq 1$.

The **nth term of a geometric sequence** is given by
$\boldsymbol{a_n = a_1 r^{n-1}}$, for any integer $n \geq 1$.

The **sum of the first n terms** of a geometric sequence is given by
$\boldsymbol{S_n = \frac{a_1(1-r^n)}{1-r}}$, for any $r \neq 1$.

When $|r| < 1$, the **limit or sum of an infinite geometric series** is given by
$$\boldsymbol{S_\infty = \frac{a_1}{1-r}}$$

10.2 Arithmetic Sequences & Series

$-8, -5, -2, 1, 4, \ldots$

common difference: $\boxed{3}$

n^{th} term: $a_n = a_1 + (n-1)d$

$= -8 + (n-1)3$

$= -8 + 3n - 3 = \boxed{3n - 11}$

12^{th} term: $a_{12} = 3(12) - 11 = 36 - 11 = \boxed{25}$

$7, 4, 1, \ldots$

find the 17^{th} term.

$a_n = a_1 + (n-1)d$

$a_{17} = 7 + (17-1)(-3)$

$= \boxed{-41}$

The sum of an arithmetic sequence is called an arithmetic series.

The sum of the first n terms is

$$S_n = \frac{n}{2}(a_1 + a_n) = \sum_{i=1}^{n} a_i$$

$11 + 7 + 3 + \ldots$

$a_{14} = 11 + (14-1)(-4)$
$= -41$

$S_{14} = \frac{14}{2}(11 + (-41))$
$= 7(-30) = \boxed{-210}$

34. $\sum_{k=5}^{20} 8k = \underbrace{8\cdot 5}_{\text{1st term}} + 8\cdot 6 + \ldots + \underbrace{8\cdot 20}_{\text{16th term}}$

$S_n = \frac{n}{2}(a_1 + a_n)$

$= \frac{16}{2}(8\cdot 5 + 8\cdot 20)$

$= 8(40 + 160)$

$= 8\cdot 200 = \boxed{1600}$

$$\sum_{i=2}^{5} i = \underbrace{2+3+4+5}_{4 \text{ terms}}$$

$(5-2)+1$

<u>10.1</u> # 59, 63, 67

<u>10.2</u> # 9, 15, 19, 21, 25, 29