121 §8.1 #s 1-4, 6, $\boxed{\underset{4th}{7-31}}$, 39, 51, $\boxed{\underset{4th}{71-79}}$, 89, 91

① A finite sequence is a function whose domain is the set of positive integers less than or equal to a fixed positive integer.

② An infinite sequence is a function whose domain is the set of ALL positive integers.

③ The terms of a sequence are the values of the dependent variable.

④ A formula that gives the n^{th} term in terms of the previous term is a recursion.

⑥ The product of the positive integers from 1 through n is n factorial.

#s 7-38 Find all terms of the finite sequence.

⑦ $a_n = n^2, \quad 1 \le n \le 7$

$1^2, 2^2, 3^2, 4^2, 5^2, 6^2, 7^2 =$

$\boxed{1, 4, 9, 16, 25, 36, 49.}$

⑪ $c_n = (-2)^{n-1}, \quad 1 \le n \le 6$

$(-2)^0, (-2)^1, (-2)^2, (-2)^3, (-2)^4, (-2)^5 =$

$\boxed{1, -2, 4, -8, 16, -32}$

121 § 8.1 #s 15-31, 39, 51, 71-79, 89, 91

15 $a_n = -6 + (n-1)(-4), \ 1 \le n \le 5$

$-6 + 0(-4) = -6$
$-6 + 1(-4) = -10$
$-6 + 2(-4) = -14$
$-6 + 3(-4) = -18$
$-6 + 4(-4) = -22$

#s 19-26 Find the 1st 4 terms & the 10th term.

19 $a_n = -.1n + 9$

$a_1 = -.1(1) + 9 = 8.9$
$a_2 = -.1(2) + 9 = 8.8$
$a_3 = -.1(3) + 9 = 8.7$
$a_4 = -.1(4) + 9 = 8.6$
$a_{10} = -.1(10) + 9 = 8$

23 $a_n = \frac{4}{2n+1}$

$a_1 = \frac{4}{2(1)+1} = \frac{4}{3}$
$a_2 = \frac{4}{2(2)+1} = \frac{4}{5}$
$a_3 = \frac{4}{2(3)+1} = \frac{4}{7}$
$a_4 = \frac{4}{2(4)+1} = \frac{4}{9}$
$a_{10} = \frac{4}{2(10)+1} = \frac{4}{21}$

#s 27-36 Find the 1st 5 terms of the infinite sequence whose nth term is given.

27 $a_n = (2n)!$ $\quad (2(1))!, (2(2))!, (2(3))!, (2(4))!, (2(5))!$

$= 2!, 4!, 6!, 8!, 10!$

$= 2, 24, 720, 40320, 3628800$

121 § 8.1 #s 31, 39, 51, 71, 75, 79, 89, 91

31 $b_n = \frac{n!}{(n-1)!}$

$\frac{1!}{(1-1)!} = \frac{1}{1} = 1$

$\boxed{1, 2, 3, 4, 5}$

$\frac{2!}{(2-1)!} = \frac{2!}{1!} = 2$

$\frac{3!}{(3-1)!} = \frac{3!}{2!} = \frac{3 \cdot 2}{2} = 3$

$\frac{4!}{(4-1)!} = \frac{4 \cdot 3 \cdot 2}{3 \cdot 2} = 4$

$\frac{5!}{(5-1)!} = \frac{5 \cdot 4 \cdot 3 \cdot 2}{4 \cdot 3 \cdot 2} = 5$

#s 37-48 write a formula for the n^{th} term of each infinite sequence. Do not use a recursion formula.

39 9, 11, 13, 15

odd numbers, increasing by 2 each step

There's a $2n + ?$ in there

$2(1) + ? = 9$ so $\boxed{2n + 7}$

$? = 7$

121 § 8.1 #s 43, 47, 51, 71, 75, 79, 89, 91

(43) 1, 8, 27, 64, ...

Each is a perfect cube.

$1^3, 2^3, 3^3, 4^3, \ldots,$ $\boxed{a_n = n^3}$

(47) $1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}$

Each is $\frac{1}{2}$ times previous,

$n = 1, \quad a_1 = 1 = \frac{1}{2^0} = \frac{1}{2^{1-1}}$

$a_2 = \frac{1}{2} = \frac{1}{2^1} = \frac{1}{2^{2-1}}$

$\boxed{a_n = \frac{1}{2^{n-1}}}$

Find 1st 4 terms & 8th term.

(51) $a_n = (a_{n-1})^2 - 3 \quad . \quad a_1 = 2$

$a_1 = 2, \quad a_2 = 2^2 - 3 = 1, \quad a_3 = 1^2 - 3 = -2, \quad a_4 = 2^2 - 3 = 1.$

$$\boxed{\begin{aligned} a_1 &= 2 \\ a_2 &= 1 \\ a_3 &= -2 \\ a_4 &= 1 \end{aligned}}$$

$a_5 = -2$

$a_6 = 1$

$a_7 = -2$

$\boxed{a_8 = 1}$

121 §8.1 #s 71, 75, 79, 89, 91

Write a formula for the n^{th} term. No recursions.

71 $0, 2, 4, 6$

Involves a $2n$, since increases by 2 each time

$2n + ?$

$n = 1$:

$2(1) + x = 0$

$x = -2$

$n = 2$:

$2(2) - 2 = 2$ ✓

$n = 3$

$2(3) - 2 = 4$ ✓

$2n - 2$ is guess

$\boxed{a_n = 2n - 2}$ (or $2(n-1)$

75 $1, 1.1, 1.2, 1.3, \ldots$

Increasing by .1 each time, starting with $a_1 = 1$. So there's a $.1n$ involved

$n = 1$:

$.1n + x = 1$

$.1(1) + x = 1$

$x = 1 - .1 = .9$

So $\boxed{.1n + .9}$ works

Tweak:

$.1n - .1 + .1 + .9$

$\boxed{.1(n-1) + 1}$ also works

79 $20, 35, 50, 65$

Increase by 15: $15n$

$n = 1 \longrightarrow a_n = 20$

$15(1) + x = 20$

$x = 5$

Try $\boxed{15n + 5}$:

Yep.

$15(1) + 5 = 20$

$15(2) + 5 = 35$

$15(3) + 5 = 50$ ✓

121 §8.1 #s 89, 91

#s 89-94 Write a recursion

89 $3, 12, 21, 30$ Each is 9 greater than the previous

$a_1 = 3$

$\boxed{a_n = a_{n-1} + 9}$

91 $\frac{1}{3}, 1, 3, 9$ Each is 3 times the previous

$a_1 = \frac{1}{3}$

$\boxed{a_n = 3a_{n-1}}$