1.2 Lines in the plane

Expand recursive definitions to infinity to find non recursive
Substitute non-recursive for n-1 in the recursive and should get non recursive

1.3 The Josephus Problem (repertoire)

$f(n) = A(n)\alpha + B(n)\beta + C(n)\gamma$ [1]
$f(1) = \alpha$ [2...]
$f(2n) = 2f(n) + \beta$
$f(2n + 1) = 2f(n) + \gamma$
Expand this at 1..9
Find possible A(n), B(n) and C(n)
Test it with $\alpha = 1,\ \beta = 0,\ \gamma = 0$ and etc in [2…]
Try f(n)=1 and f(n)=n and find $\alpha,\ \beta,\ \gamma$
Combine test results into a system of equations to find A(n), B(n) and C(n)

2.1 Sums

$$\sum_{1 \le k \le n} a_k = \sum_{1 \le k+1 \le n} a_{k+1} = \sum_{k=0}^{n-1} a_{k+1}$$

$$\sum_{k=0}^{n} 1 = (n + 1)$$

Iverson bracket: $[x > 1]$ - either 1/0

2.2 Sums and recurrences

$$S_n = \sum_{k=0}^{n} a_k$$

$S_0 = 0$

$S_n = S_{n-1} + a_n,\ for\, n > 0$

$a_n T_n = b_n T_{n-1} + c_n$

$s_n a_n T_n = s_n b_n T_{n-1} + s_n c_n$

$s_n b_n = s_{n-1} a_{n-1}$

$T_n = \frac{1}{s_n a_n}(s_1 b_1 T_0 + \sum_{k=1}^{n} s_k c_k)$

$s_n = \frac{a_{n-1} a_{n-2} \dots a_1}{b_n b_{n-1} \dots b_2}$

If recurrence has sum, subtract n from n-1 to get rid of it

$H_n = \sum_{k=1}^{n} \frac{1}{k}$