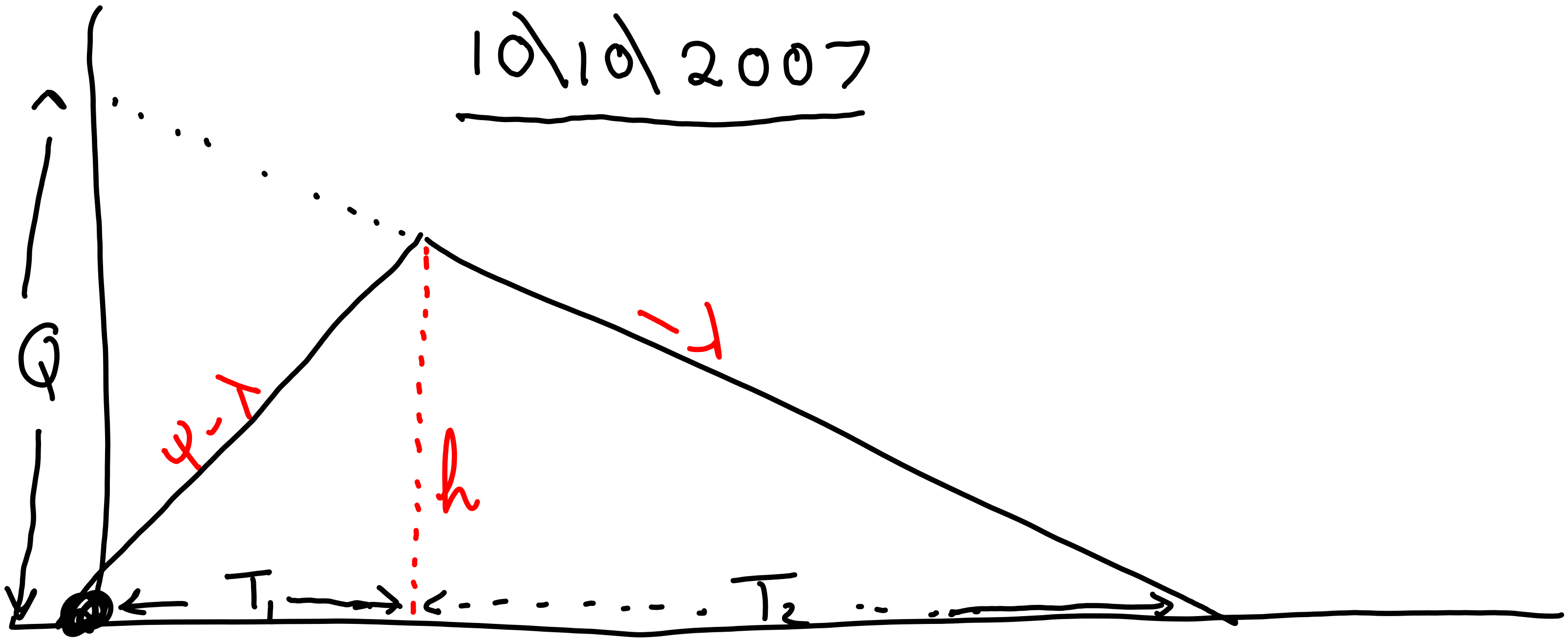
10\10\2007



Ordered goods arrive at a rate ψ

Ordering Cost : $\frac{A\lambda}{Q}$

Inventory Cost : $\frac{1}{2} I h$

$= \frac{1}{2} I \left(1 - \frac{\lambda}{\psi}\right) Q$

$h = (\psi - \lambda) T_1$

$= \lambda T_2$

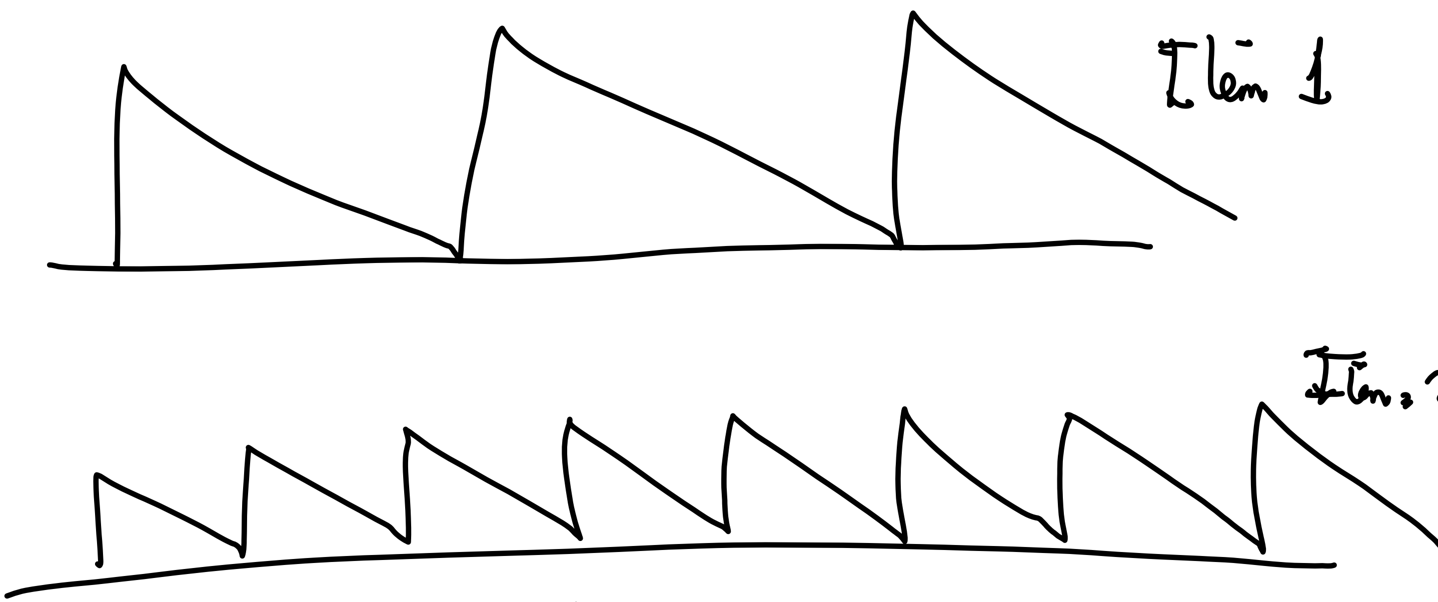
$T_1 + T_2 = T = \frac{Q}{\lambda}$

Total Cost = $\frac{A\lambda}{Q} + \frac{1}{2} I \left(1 - \frac{\lambda}{\psi}\right) Q$: $Q^* = Q_w \left(\frac{\psi}{\psi - \lambda}\right)^{\frac{1}{2}}$.

n distinct items, each with characteristics of Model 1.

A : cost of making an order.

λ_i : demand for item i.



Makes sense to order everything at same time.

Common T & $Q_j = \lambda_j T$

Total Cost =

$$\frac{A}{T} + \left(\frac{1}{2} \sum_{j=1}^{n} \lambda_j I_j\right) T$$

$Q_j/2$

$$T^* = \left(\frac{2A}{\sum_j \lambda_j I_j}\right)^{1/2}$$

Now we add a constraint

$$\sum_{j=1}^{n} f_j Q_j \le f$$ Resource Constraint

We assume that order cost = sum of order costs per item

minimize total cost

$$= \sum_j \left(\frac{\lambda_j A_j}{Q_j} + \frac{I_j Q_j}{2} \right)$$

s.t. $$\sum_{j=1}^{n} f_j Q_j \le f$$

$\Downarrow$

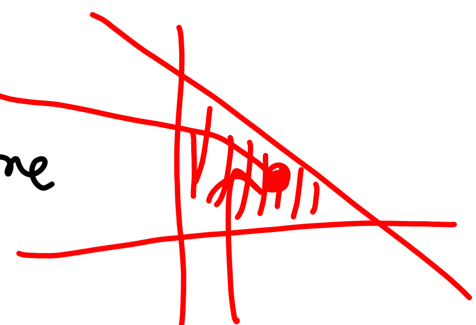
unless $\geq$

Should really be using previous model i.e. order all items at same time, Minimise $$\sum_{j=1}^{n} \phi_j(Q_j)$$

s.t. $$\sum_{j=1}^{n} f_j Q_j \le f$$

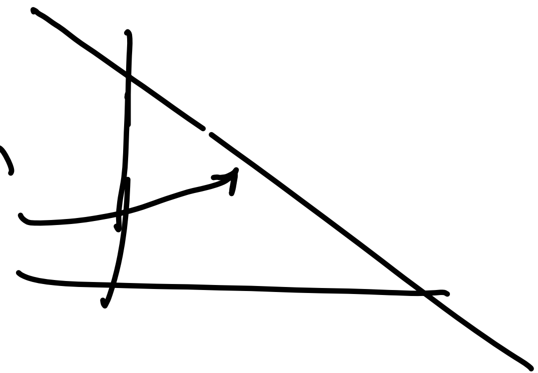
(i) Compute Q_j^* = minimiser of ϕ_j — Wilson Lot Size for each j

If $\sum_{j=1}^{n} f_j Q_j^* \le f$ — done



feasible region

Otherwise: Optimum lies on boundary.



Now minimise $\sum_{j=1}^{n} \phi_j(Q_j)$ s.t. $\sum_{j=1}^{n} f_j Q_j = f$

$$L = \sum_{j=1}^{n} \phi_j(Q_j) + \lambda\left(\sum_{j=1}^{n} f_j Q_j - f\right)$$

$$\frac{\partial L}{\partial Q_j} = 0, \quad j = 1 \ldots n \quad \& \quad \frac{\partial L}{\partial \lambda} = 0.$$