Cheat sheet Risk Management case 1.

# Part 1

1.1)

**Portfolio Value (on Nov 21, 2022):**  
  Portfolio = –N₁ × P₁ + N₂ × P₂ + N₃ × P₃  
  (where N = number of shares, P = price)

**Simple Return (day *t*):**  
  Rₜ = (Pₜ – Pₜ₋₁) / Pₜ₋₁

**3. Volatility (σ):**  
  σ = STDEV(Rₜ₋ₙ, ..., Rₜ₋₁)  
  (use n = 125 or 250)

Math Standard dev: σ = √[ (1 / (n − 1)) × Σ (Rᵢ − R̄)² ]  
    where i = 1 to n

**4. VaR (99%, 1 day):**  
  VaR = z × σ × |Position Value|  
  (z = 2.326)

Briefly comment on the eﬃcacy of this approach:

The use of 250 days smooths out short-term shocks but may underestimate recent risks, while 125 days reacts more quickly but may be more volatile. While the i.i.d. assumption simplifies VaR computation, it fails to account for volatility clustering, where periods of high or low volatility tend to occur consecutively (skewness / fat tails).

2.1)

Covariance Matrix BIG SIGMA

Portfolio Weights  
wi =Ni ⋅Pi / Vportfolio

Portfolio volatility  
σportfolio =w′Σw

VaR Portfolio (asset normal)

VaRportfolio =α⋅σportfolio ⋅Vtotal

The diversified VaR, calculated using the correlation between assets, is **lower** than the undiversified VaR (sum of individual VaRs).  
 This reflects the **benefit of diversification**—correlated assets tend to offset each other's risk to some extent. The short POSition on nestle’ reduces the value at risk since its positively correlated with the other 2 stock

2.3)

# Part 2

**Part 2.1** calculate stocks betas. Beta = Covariance(r\_i, r\_m) / Var(r\_m)

Which stock has lowest systemic risk is stock with beta closest to 0. Answer: SREN (highest beta, meaning its most exposed to market risk)

Highest systemic risk is stock with furthest away from 0. Answer: NESN (lowest beta, meaning less sensitive to market changes than other two stocks)

What does beta mean: Beta = 1 => stock moves 1-to-1 with market (market up, stock up same amount), Beta > 1 => Stock is **more volatile** than the market (if market goes up 2%, stock goes up 2% \* Beta (for example 2) as much.) Beta < 1 => Stock is **less volatile** than the market (if market moves up or down, stock moves up or down less). Beta = 0 => Stock is **uncorrelated** with the market (stock may move up or down no matter what market does). Beta < 0 => Stock moves **opposite** to the market (market goes up, stock goes down)

Part 2.2