1. A female, 38-year-old, 66 kg, 5'6" tall is being treated for serious bacterial infection. Her serum creatinine is 1.8 mg/dL. What would be your suggested initial dose with the given information?

First, check if TBW is > 120% of IBW, if not use TBW for CLcr calculations

\[
IBW = 45.5 \text{kg} + 2.3 \text{kg} \times (66 - 60) = 59.3 \text{ kg} \quad \Rightarrow \quad 120\% = 71.2 \text{ kg} \quad (\text{Since } 66 \text{ kg} < 71.2 \text{ kg, use TBW})
\]

\[
CL = CLcr = 0.85 \times (140 - \text{age}) \times (TBW)/(72 \times 1.8) \quad \Rightarrow 44.6 \text{ mL/min}
\]

Answer: 1000 q24h

2. CJ, A 58-year old woman was infected with staphylococcus. Her body weight is 68kg, height is 5.5 feet and her serum creatinine was 1.04 mg/dL. The physician started her with 500 mg of vancomycin every 12 hours but not sure if that dose is sufficient. The MIC for this particular woman is 4 \( \mu \text{g/mL} \). How would you use your PK knowledge to determine if 500 mg is sufficient besides using the nomogram? Please show appropriate calculations.

\[
Vd = 0.17 \times \text{age} + 0.22 \times \text{TBW} + 15 \ [\text{L}] \quad \Rightarrow \quad Vd = 0.17 \times (58) + 0.22 \times (68) + 15 = 39.8 \text{ L}
\]

\[
CL = CLcr = 0.85 \times (140 - \text{age}) \times (TBW)/(72 \times 1.04) \quad \Rightarrow 63.3 \text{ mL/min} \quad \Rightarrow 3.8 \text{ L/hr}
\]

\[
K_e = CL/Vd \quad \Rightarrow \quad 0.0953 /\text{hr}
\]

\[
\text{Css, peak} = (S \times F \times \text{dose}/Vd)/(1 - e^{-K_e \times \text{tou}}) \quad \Rightarrow \quad ((1) \times (1) \times (500))/39.8)/(1 - e^{-0.0953 \times 12}) = 18.4 \ \mu\text{g/mL}
\]

\[
\text{Css, trough} = \text{Css, peak} \times e^{-K_e \times \text{tou}} \quad \Rightarrow \quad 5.87 \ \mu\text{g/mL}
\]

Conclusion: should have trough level 4X MIC at least. Therefore, current dose not high enough.
3. Provide a personalized effective dosing regimen of vancomycin for CJ in question 2.
   1000 mg q12hr produceCss, trough ➞ 11.7 µg/mL. Still not enough
   1000 mg q8hr produceCss, trough ➞ 21.9 µg/mL. Target dose.

4. It was unfortunate that CJ while on vancomycin treatment suffered a severe burn. Her serum creatinine level and volume of distribution increased by 20% and 48%, respectively. How would you adjust her current treatment? Please show new calculations.
   New Vd = 58.9 L
   New CL = 53.0 mL/min
   New ke = CL/Vd = 0.054 /hr
   New Css, peak = (S*F*dose/Vd)/(1-e^{-ke*tou}) ➞ ((1)*(1)*(1000)/58.9)/(1-e^{-0.054*8}) = 48.4 µg/mL
   New Css, trough = C,peak*e^{-ke*tou} ➞ 48.4*e^{-0.054*8} = 31.4 µg/mL.

   The current dose of 1000 mg q8hr may have Ctrough that is too high. The dose should be reduced to 1000 mg q12h (Css, trough of 18.6 µg/mL). The calculations assume MIC stays the same at 4 µg/mL.

   **Best Css, trough is given 1000 mg q12h ➞ 18.6 µg/mL**

5. Drug X with a half-life of 4 hours was administered as IV bolus at 100 mg to both young and elderly subjects.
   Assume similar total exposure in both population, draw the concentration-time profiles of Drug X after single IV dosing and after 5 IV dosing on two separate figures. Discuss the following for both population:
   a. Loading dose ➞ elder > young
   b. Dosing interval ➞ elder > young
Different $V_d$
Elderly $\uparrow V_d \Rightarrow$ longer $t_{1/2}$