SCENARIO CARDS (SAMPLE RESPONSES)

Scenario 1	Scenario 2
$y=(2)^{0.04t}$, $t=?$ when $y=30$ $30=(2)^{0.04t}$ $\log_2(30)=\log_2\left((2)^{0.04t}\right)$ $\log_2(30)=0.04t$ $\frac{\log_2(30)}{0.04}=\frac{0.04t}{0.04}$ $\frac{\log_2(30)}{0.04}=t$ $t\approx 122.67$ The raw chicken wing will reach an unsafe level of bacteria after **2 hours and 2 minutes**.	$y=30,000(0.9)^t$, $t=?$ when $y=15,000$ $15,000=30,000(0.9)^t$ $\frac{15,000}{30,000}=\frac{30,000(0.9)^t}{30,000}$ $0.5=(0.9)^t$ $\log_{0.9}(0.5)=\log_{0.9}\left((0.9)^t\right)$ $\log_{0.9}(0.5)=t$ $t\approx 6.58$ In **7 years**, I can resell the truck for half of what I paid for it.

Scenario 3	Scenario 4
$y = 27e^{-0.02t}$, $t = ?$ when $y = 0.1(27) = 2.7$ $2.7 = 27e^{-0.02t}$ $\frac{2.7}{27} = \frac{27e^{-0.02t}}{27}$ $0.1 = e^{-0.02t}$ $\ln(0.1) = \ln\left(e^{-0.02t}\right)$ $\ln(0.1) = -0.02t$ $\frac{\ln(0.1)}{-0.02} = \frac{-0.02t}{-0.02}$ $\frac{\ln(0.1)}{-0.02} = t$ $t \approx 115.13$ $1986 + 115.13 = 2101.13$ It will be **2102** when the amount of Cesium-137 in the atmosphere reaches 10% of the initial amount released.	$y = 650\left(\frac{1}{2}\right)^{1.1t}$ $t = ?$ when $y = 0.01(2 * 325) = 6.5$ $6.5 = 650\left(\frac{1}{2}\right)^{1.1t}$ $\frac{6.5}{650} = \frac{650\left(\frac{1}{2}\right)^{1.1t}}{650}$ $0.01 = \left(\frac{1}{2}\right)^{1.1t}$ $\log_{\frac{1}{2}}(0.01) = \log_{\frac{1}{2}}\left(\left(\frac{1}{2}\right)^{1.1t}\right)$ $\log_{\frac{1}{2}}(0.01) = 1.1t$ $\frac{\log_{\frac{1}{2}}(0.01)}{1.1} = \frac{1.1t}{1.1}$ $\frac{\log_{\frac{1}{2}}(0.01)}{1.1} = t$ $t \approx 6.04$ In **6 hours**, there will be less than 1% of the medicine left in someone's system, and they can safely take the next dosage.

Scenario 5	Scenario 6
$y = 270e^{0.01t}$, $t = ?$ when $y = 350$ million $350 = 270e^{0.01t}$ $\frac{350}{270} = \frac{270e^{0.01t}}{270}$ $\frac{35}{27} = e^{0.01t}$ $\ln\left(\frac{35}{27}\right) = \ln\left(e^{0.01t}\right)$ $\ln\left(\frac{35}{27}\right) = 0.01t$ $\frac{\ln\left(\frac{35}{27}\right)}{0.01} = \frac{0.01t}{0.01}$ $\frac{\ln\left(\frac{35}{27}\right)}{0.01} = t$ $t \approx 25.95$ $2000 + 25.95 = 2025.95$ The U.S. population will be over 350 million people in **2026**.	$y = 700e^{-0.26t} + 90$, $t = ?$ when $y = 140$ $140 = 700e^{-0.26t} + 90$ $-90 \qquad -90$ $50 = 700e^{-0.26t}$ $\frac{50}{700} = \frac{700e^{-0.26t}}{700}$ $\frac{1}{14} = e^{-0.26t}$ $\ln\left(\frac{1}{14}\right) = \ln\left(e^{-0.26t}\right)$ $\ln\left(\frac{1}{14}\right) = -0.26t$ $\frac{\ln\left(\frac{1}{14}\right)}{-0.26} = \frac{-0.26t}{-0.26}$ $\frac{\ln\left(\frac{1}{14}\right)}{-0.26} = t$ $t \approx 10.15$ It takes approximately **10 minutes** for the pizza to reach the ideal temperature.

Scenario 7	Scenario 8
$y = 2400e^{-0.25t} + 75$, $t = ?$ when $y = 100$	$y = A_0 e^{r \cdot t}$, $t = ?$ when $y = 0.98(A_0)$
$100 = 2400e^{-0.25t} + 75$ $-75 \qquad -75$ $25 = 2400e^{-0.25t}$ $\frac{25}{2400} = \frac{2400e^{-0.25t}}{2400}$ $\frac{1}{96} = e^{-0.25t}$ $\ln\left(\frac{1}{96}\right) = \ln\left(e^{-0.25t}\right)$ $\ln\left(\frac{1}{96}\right) = -0.25t$ $\frac{\ln\left(\frac{1}{96}\right)}{-0.25} = \frac{-0.25t}{-0.25}$ $\frac{\ln\left(\frac{1}{96}\right)}{-0.25} = t$ $t \approx 18.26$ It will be approximately **18 hours** before the tiles are safe to touch.	$0.98A_0 = A_0 e^{-0.0001 \cdot t}$ $\frac{0.98A_0}{A_0} = \frac{A_0 e^{-0.0001t}}{A_0}$ $0.98 = e^{-0.0001t}$ $\ln(0.98) = \ln\left(e^{-0.0001t}\right)$ $\ln(0.98) = -0.0001t$ $\frac{\ln(0.98)}{0.0001} = \frac{-0.0001t}{0.0001}$ $\frac{\ln(0.98)}{-0.0001} = t$ $t \approx 202.02$ $(Current\ Year) - 202.5.95 =$ __________ Sadly, your friend is mistaken, as this tree was cut down after the War of 1812.