Solutions to Summative Assessment version 16000

① $P = 16000$

$n =$ Quarterly

$n = 4$

$r\% = 8.8\%$

$r = 0.088$

Model $\boxed{A(x) = 16000\left(1 + \frac{0.088}{4}\right)^{4x}}$

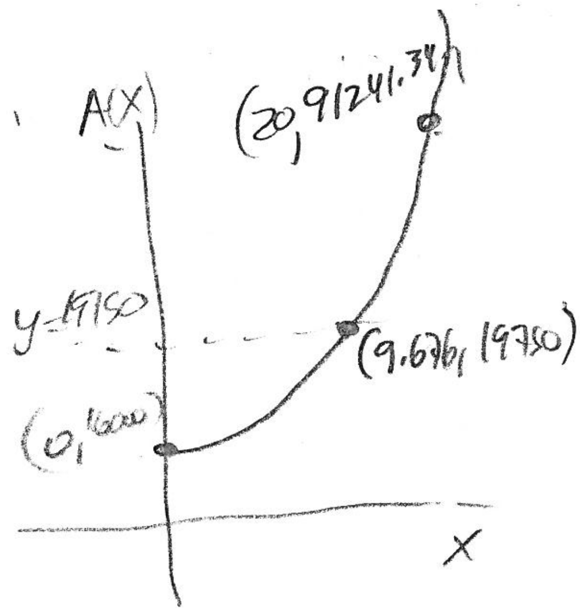
② What will balance of Account be in 20 years

$A(20) = 16000\left(1 + \frac{0.088}{4}\right)^{4(20)}$

$= 16000\left(1 + \frac{0.088}{4}\right)^{80}$

$= 16000\,(1.022)^{80}$

$A(20) \approx 91241.34$



③ When will the account balance be 19750?

$A(x) = 19750$

$19750 = 16000\left(1 + \frac{0.088}{4}\right)^{4x}$

$\frac{19750}{16000} = \frac{16000\left(1 + \frac{0.088}{4}\right)^{4x}}{16000}$

$\frac{19750}{16000} = \left(1 + \frac{0.088}{4}\right)^{4x}$

$\log_{\left(1 + \frac{0.088}{4}\right)}\left(\frac{19750}{16000}\right) = 4x$

$x = \frac{\log_{\left(1 + \frac{0.088}{4}\right)}\left(\frac{19750}{16000}\right)}{4}$

$x \approx 9.676$

OR

$\log\left(\frac{19750}{16000}\right) = \log\left(1 + \frac{0.088}{4}\right)^{4x}$

$\log\left(\frac{19750}{16000}\right) = 4x \log\left(1 + \frac{0.088}{4}\right)$

$\frac{\log\left(\frac{19750}{16000}\right)}{4\log\left(1 + \frac{0.088}{4}\right)} = \frac{4x \log\left(1 + \frac{0.088}{4}\right)}{4\log\left(1 + \frac{0.088}{4}\right)}$

$x = \frac{\log\left(\frac{19750}{16000}\right)}{4\log\left(1 + \frac{0.088}{4}\right)}$

$x \approx 9.676$

Solutions version 16000

$A(x) = 6400\left(1 + \frac{0.0058}{52}\right)^{52x}$

$P = 6400$

$r = 0.058$

$r\% = 100r = 5.8\%$

$n = 52$ (weekly

(4) $r = 0.058$

$r\% = 5.8\%$

(5) Initial Investment $= 6400$

(6) How often is interest compounded?

$n = 52$ weekly

(7) If $P = 6400$ & $r = 0.058$, but $n =$ monthly $\rightarrow n = 12$

Then write new model

$$\boxed{A(x) = 6400\left(1 + \frac{0.058}{12}\right)^{12(x)}}$$

New model monthly

Radioactive Decay Model

Half Life 90 years

Initial Amount 150 grams

Amount at half life 75 grams

$A(x) = Pe^{rx}$

$A(90) = \frac{1}{2}(150) = 75$

$A(90) = 75$

8 $A(90) = 150e^{r(90)}$

$75 = 150e^{90r}$

$\frac{75}{150} = \frac{150e^{90r}}{150}$

$\frac{1}{2} = e^{90r}$

$\ln\frac{1}{2} = 90r$

9 $\boxed{r = \frac{\ln\frac{1}{2}}{90}}$

$r \approx -0.0077$

$r\% = 100r = -0.77\%$

Model

$A(x) = 150e^{\frac{\ln\frac{1}{2}}{90}x}$

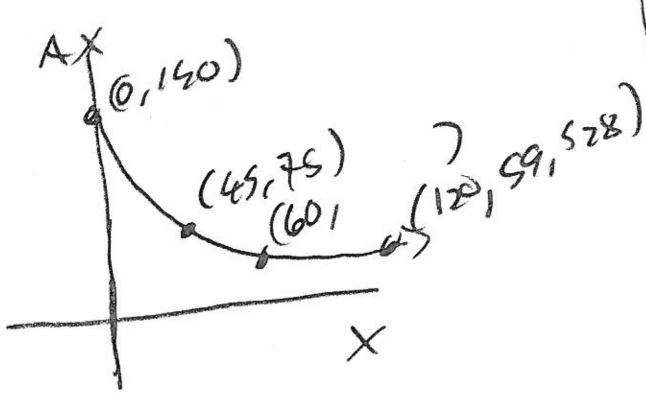
$A(x) = 150e^{-0.0077x}$

10 Population after 120 years

$A(120) = 150e^{\frac{\ln\frac{1}{2}}{90}(120)}$

$= 150e^{\frac{4}{3}\ln\frac{1}{2}}$

$\approx 59.528g$



Typo version

OR $A(60) = 150\left(e^{\frac{\ln\frac{1}{2}}{90}(60)}\right)$

$= 150e^{\frac{2}{3}\ln\frac{1}{2}}$

$\approx$

Solutions Version 16000

$A(x) = 4.8e^{0.0096x}$

$$\boxed{\begin{aligned} r &= 0.0096 \\ r\% &= 100r = 0.96\% \end{aligned}}$$

#11

$A(x) = 4.8e^{0.0096x}$

$A(x)$ → population in millions x years after 2020

4.8 → Initial pop is 4.8 million

x → years since 2020

$x = 0$ means year 2020

$x = 15$ means year 2020+15 = 2035

$x = 2035$ means year 2020 + 2035 = 4055

#12 Equation that yields population 5600000

Since $A(x)$ measured in millions

$5600000 \rightarrow \frac{5600000}{1000000} \rightarrow 5.6$

$$\boxed{\text{So } 5.6 = 4.8e^{0.0096x} \text{ is the correct equation}}$$

(13) $A(2035) = 4.8e^{0.0096(2035)}$

$= 4.8e$

$\approx 1.464 \times 10^{15}$

$A(2035)$ = population after 2035 years

$= 2035 + 2020 = 4055$ year

(14) $A(15) = 4.8e^{0.0096(15)}$

$= 4.8e$

≈ 5.543

5.543 million

(15) So in the year 2035 Population is growing

Pop is approximately 5.543 million