

# Sample Quiz 2 Solutions

① Given  $P = 18000$

$$b = 1.25 \text{ (growth factor)}$$

①a

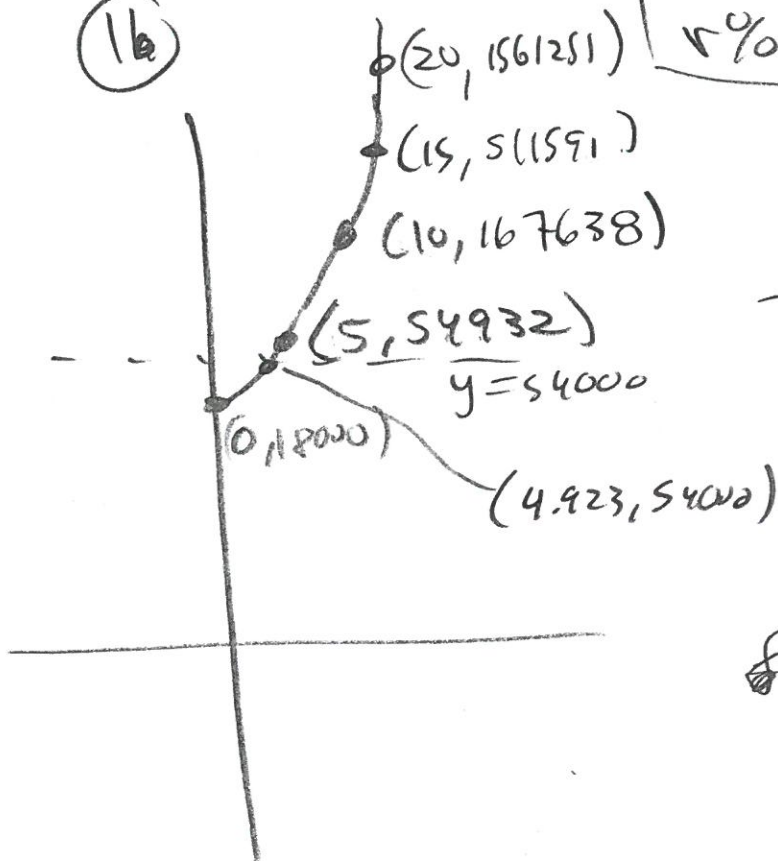
$$b = 1+r \rightarrow r = b-1 = 1.25-1 = 0.25$$

$$r = 0.25 \text{ growth rate}$$

$$r\% = 25\%$$

①a

①b



Triple initial population

$$3(18000) = 54000$$

$$x \in [0, 5)$$

$$A = 18000(1.25)^x$$

$$54000 = 18000(1.25)^x$$

$$\frac{54000}{18000} = \frac{18000(1.25)^x}{18000}$$

$$3 = 1.25^x$$

$$\text{Defn } \log_{1.25} 3 = x$$

$$x \approx 4.923$$

Method (2) Apply log

$$3 = 1.25^x$$

$$\log 3 = \log 1.25^x$$

$$\log 3 = x \log 1.25$$

$$x = \frac{\log 3}{\log 1.25} = \log_{1.25} 3 \approx 4.923$$

$$\textcircled{1d} \quad A(x) = 18000(1.25)^x$$

2.7 times initial Pop

$$(2.7)(18000) = 48600$$

$$A(x) = 48600 = 18000(1.25)^x$$

$$\frac{48600}{18000} = \frac{18000(1.25)^x}{18000}$$

$$2.7 = 1.25^x$$

method 1  
Defn  $\rightarrow$

$$\log_{1.25} 2.7 = x \approx 4.451$$

method 2

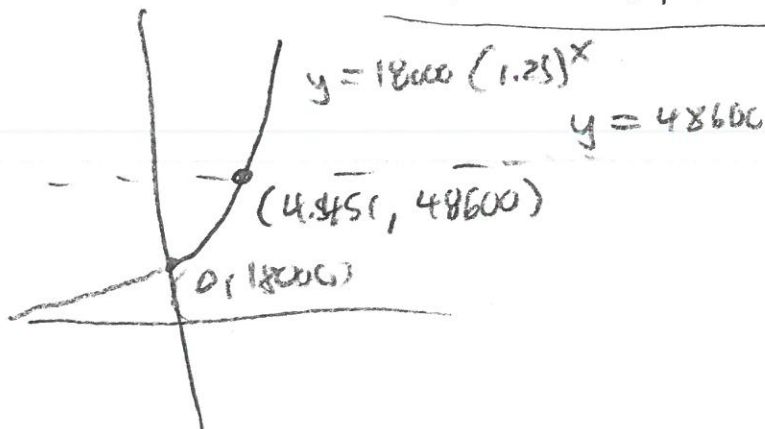
$$\log 2.7 = \log (1.25)^x$$

$$\log 2.7 = x \log (1.25)$$

$$x = \frac{\log 2.7}{\log (1.25)} \approx 4.451$$

$$x = \log_{1.25} 2.7 \approx 4.451$$

method 3



$$\textcircled{2} \quad A(10) = 11199$$

$$gr\% = 102\%$$

$$r = 1.02$$

$$b = 1.02 + 1 = 2.02$$

$$A(x) = P(2.02)^x$$

$$11199 = P(2.02)^{10}$$

$$P = \frac{11199}{(2.02)^{10}} \approx 9.9$$

$$A(x) \approx 9.9(2.02)^x$$

$$\checkmark \checkmark \quad A(10) = 9.9(2.02)^x = 11198.2$$

③  $P = 1800$

decay rate = ?

decay factor = 0.856

$r = 1 - b$   
 $= 1 - 0.856$

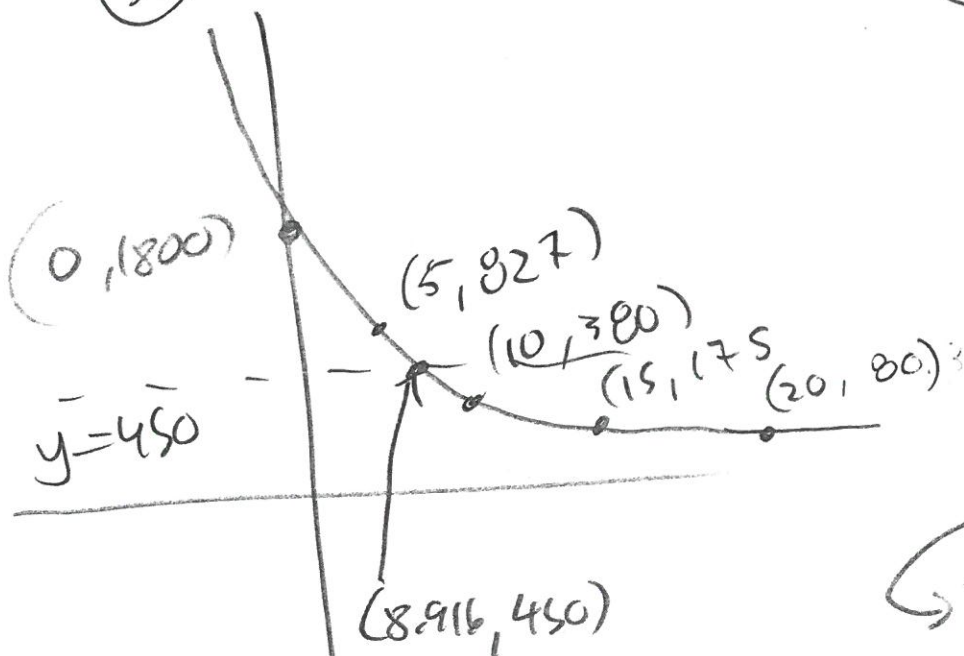
$r = 0.144$   
 $r\% = 14.4\%$

Model

$A(x) = 1800(0.856)^x$

3a

3b



3c when is pop  $\frac{1}{4}$  initial size

$\frac{1}{4}(1800)$   
 $450$

$x \in [10, 15]$

$A = 1800(0.856)^x$

$450 = 1800(0.856)^x$

$\frac{450}{1800} = \frac{1800(0.856)^x}{1800}$

$\frac{1}{4} = 0.856^x$

Method (2) Apply log

$\frac{1}{4} = 0.856^x$

$\log\left(\frac{1}{4}\right) = \log(0.856)^x$

$\log\left(\frac{1}{4}\right) = x \log(0.856)$

$x = \frac{\log\left(\frac{1}{4}\right)}{\log(0.856)} = \log_{0.856} \frac{1}{4} = 8.916$

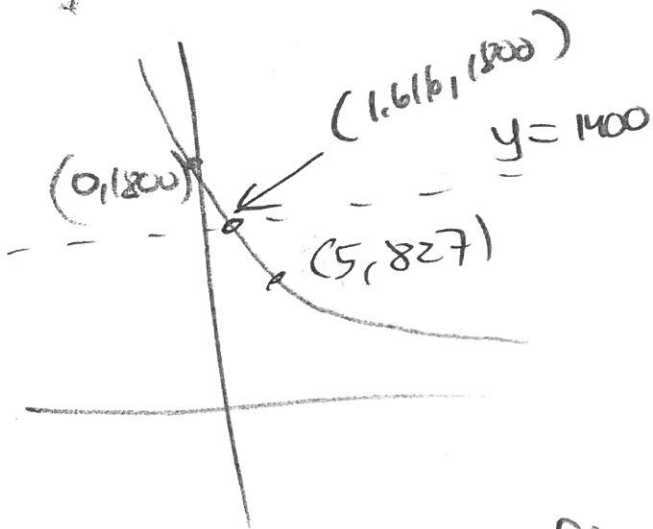
Method (1)  $\log_{0.856} \frac{1}{4} =$

Def. of log

$x \approx 8.916$

# Sample Quiz & Solution

3) When does Pop. reach 1400?



$$x \in [0, 5)$$

$$A = 1800(0.856)^x$$

$$1400 = 1800(0.856)^x$$

$$\frac{1400}{1800} = \frac{1800(0.856)^x}{1800}$$

$$\rightarrow \frac{7}{9} = 0.856^x$$

Do  
not  
round

Method (1) Def. of Log

$$\log_{0.856} \left( \frac{7}{9} \right) = x$$

$$x \approx 1.616$$

Method (2) Apply Log

$$\log \frac{7}{9} = \log 0.856^x$$

$$\log \frac{7}{9} = x (\log 0.856)$$

$$x = \frac{\log \left( \frac{7}{9} \right)}{\log (0.856)}$$

$$= \log_{0.856} \left( \frac{7}{9} \right)$$

$$\approx 1.616$$

④  $P = \text{unknown}$

$$x = 4$$

$$A(4) = 1200$$

decay rate 16%

$$r = 0.16$$

$$b = 1 - r = 1 - 0.16$$

$b = 0.84$  decay factor

$$\text{Solve } 1200 = P(0.84)^4$$

$$\frac{1200}{(0.84)^4} = P$$

$$P \approx 2410.3$$

$$\text{model } A(x) = 2410(0.84)^x$$