

Question 10:

$$a) (i) B_1 = 1000(1.06) - 72 = \cancel{1132} \$988$$

$$(ii) B_n = 1000(1.06)^n - 72(1.06)^{n-1} - \dots - 72.$$

$$= 1000(1.06)^n - 72(1 + 1.06 + 1.06^2 + \dots + 1.06^{n-1})$$

$$= 1000(1.06)^n - 72 \left( \frac{1(1.06^n - 1)}{0.06} \right)$$

$$= 1000(1.06)^n - 72 \left( \frac{1.06^n - 1}{0.06} \right)$$

$$= 1000(1.06)^n - 1200(1.06^n - 1)$$

$$= 1000(1.06)^n - 1200(1.06)^n + 1200$$

$$= 1200 + 1.06^n(1000 - 1200)$$

$$= 1200 - 200(1.06)^n$$

$$(iii) \cancel{B_{10} = 1000(1.06)^{10} - 72}$$

$$B_{10} = 1200 - 200(1.06)^{10} = \$841.83 \text{ (2 dp)}$$

$$\therefore B_1 = 841.83(1.06) - 90$$

$$B_n = 841.83(1.06)^n - 90(1.06)^{n-1} - \dots - 90$$

$$0 = 841.83(1.06)^n - 90(1 + 1.06 + 1.06^2 + \dots + 1.06^{n-1})$$

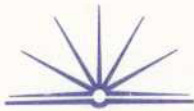
$$841.83(1.06)^n = 90 \left( \frac{1.06^n - 1}{0.06} \right)$$

$$841.83(1.06)^n = 1500(1.06^n - 1)$$

$$841.83(1.06)^n = 1500(1.06)^n - 1500$$

$$1500 = (1.06)^n(1500 - 841.83)$$

$$\therefore n = 14 \text{ (0 dp) years.}$$



b) (i) Claire  $\Rightarrow$

~~time~~ time taken for FG :

$$250 \div 4 = 62.5 \text{ secs}$$

~~$\sin \theta = \frac{FG}{FP}$~~   $\frac{FG}{FP}$

$$\cos \theta = \frac{FG}{FP} = \frac{250}{FP}$$

$$\therefore FP = \frac{250}{\cos \theta}$$

$$\text{time} \therefore FP = \frac{62.5}{\cos \theta} \div 4 = \frac{62.5}{4 \cos \theta} \text{ secs.}$$

Bus  $\Rightarrow$

time taken for DG :

$$2000 \div 15 = 133 \frac{1}{3} \text{ sec}$$

~~$\sin \theta = \frac{FG}{GP}$~~   $\frac{FG}{GP}$

$$\therefore \tan \theta = \frac{FG}{GP} = \frac{250}{GP}$$

$$\therefore GP = \frac{250}{\tan \theta}$$

~~time taken for GP :~~

~~time~~ time taken for GP :

$$GP = \frac{250}{\tan \theta} \div 15 = \frac{250}{15 \tan \theta} \text{ sec}$$

$$\therefore DP = \left( \frac{250}{15 \tan \theta} + 133 \frac{1}{3} \right) \text{ secs.}$$



(ii)  ~~$\frac{250}{15 \tan \theta} + 133 \frac{1}{3} = \frac{62.5}{4 \cos \theta}$~~

$$\frac{250}{15 \tan \theta} + 133 \frac{1}{3} = \frac{62.5}{4 \cos \theta}$$

$$\frac{1000 \cos \theta}{15 \tan \theta} + 533 \frac{1}{3} \cos \theta = 62.5$$

$$\frac{1000 \cos \theta}{15 \frac{\sin \theta}{\cos \theta}} + 533 \frac{1}{3} \cos \theta = 62.5$$

$$\frac{1000 \cos^2 \theta}{15 \sin \theta} + 533 \frac{1}{3} \cos \theta = 62.5$$

$$1000 \cos^2 \theta + 8000 \cos \theta \sin \theta = 62.5 \sin \theta$$

$$1000 \cos^2 \theta + 8000 \cos \theta \sin \theta - 62.5 \sin \theta = 0.$$

$$1000 \cos^2 \theta + 62.5 \sin \theta (128 \cos \theta - 1) = 0.$$