3. Two years from now, you would like to have $10,500.00 for your first semester of university. A wise financial advisor offers you a rate of 6.2% p.a. compounded monthly.

a) How much would you have to invest today to achieve your goal? (3 marks)

$$P = \frac{P}{(1+i)^n}$$

$$= \frac{10\,500}{\left(1+\frac{0.062}{12}\right)^{2\times12}}$$

∴ you have to invest $9278.45 today to achieve the goal

$$P = 9278.45$$

3

b) You don't have the money to invest today as one lump sum! So, you have decided to start a side business of tutoring your friends in financial mathematics! You do quite well and consistently make $90 every week tutoring. You invest your money on a weekly basis for two years, with the hope that you can have the $10500.00 needed for the first semester.

i) How much are all your weekly investments worth in 2 years if you earn 6.2% p.a. compounded weekly? (3 marks)

$$FV = \frac{R\left((1+i)^n -1\right)}{i}$$

$$= \frac{90\left(\left(1+\frac{0.062}{12}\right)^{2\times12} -1\right)}{\frac{0.062}{12}}$$

∴ the total of the weekly investments is $2293.34

$$FV = 2293.34$$

2

ii) Do you have enough money to achieve your goal? Justify your answer. (2 marks)

No, sadly you are off by quite alot. You still need $8206.66 to meet the goal of $10500.00. Your investments need to be greater or the same as your goal. Should've started saving earlier! :)

Invst ≥ Goal

FALSE 2293.34 ≱ 10500.00 ∴

Goal - Investment
= 10500 - 2293.34
= $8206.66

2

4. If you invest $350 at 9% compounded quarterly, how long, to the nearest half of a year, will it take for your money to triple? (4 marks)

$A = 3P$

$= 3(350)$

$A = 1050$

$A = P(1+i)^n$

$1050 = 350(1+\frac{0.09}{4})^n$

$3 = (1+\frac{0.09}{4})^n$

$3 = 1.0225^n$

∴ Guess + Check

$n \neq 49 \quad 3 \leq 2.975106507$

$n = 50 \quad 3 \leq 3.0420464$

Because n is the number of quarter, it needs to be divided by 4 to get the number of years.

$\frac{n}{4}$

$= \frac{50}{4}$

$= 12.5$

∴ it would take 12.5 years for $350 to triple at the given interest rate.

4

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5. You've just bought your first car! It's a 1978 AMC Pacer....known as the fishbowl of cars. It's a beauty! You paid just $5999.50 for this awesome car! The interest rate you got from the bank for your car loan is 7.5% p.a. compounded <u>biweekly</u>. The loan is for 5 years.

a) Calculate your biweekly car payments. (4 marks)

$PV = \frac{R(1-(1+i)^{-n})}{i}$

$R = \frac{PV \times i}{(1-(1+i)^{-n})}$

$= \frac{5999.50 \times \frac{0.075}{26}}{(1-(1+\frac{0.075}{26})^{-5\times26})}$

$R = \$55.41$

∴ the bi-weekly payment would be $55.41 to pay off the loan in 5 years.

4

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b) How much money did the bank make? (2 marks)

(Bi-weekly payment × # of payments) − Original amount = Bank Money Earned

$55.41 \times (5 \times 26) - 5999.50 =$

$\$1703.80 = $ Bank Money Earned

∴ the bank earned $1703.80 off of the loan.

2

10

6. You have won a prestigious award for your hard work this year at CHCI. One week from today, you will start receiving weekly payments of $15 for two years. If money earns 13% compounded weekly, how much money will CHCI need to put into an account today, so that there is enough money to fund the award? (3 marks)
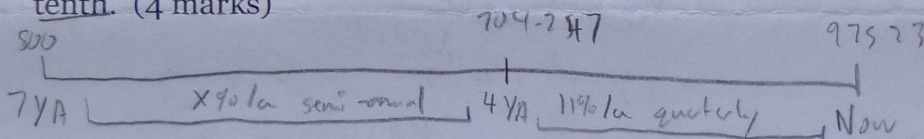
$$PV = \frac{R(1-(1+i)^{-n})}{i}$$

$$= \frac{15\left(1-\left(1+\frac{0.13}{52}\right)^{-52 \times 2}\right)}{\frac{0.13}{52}}$$

$$PV = \$1372.19$$

∴ CHCI needs to put in $1372.19 today so that there is enough money for the award.

3

7. Seven years ago you invested $500 at x% p.a. compounded semi-annually for four years. Then you took that money and invested it for 3 more years at 11% p.a. compounded quarterly and ended up with $975.23. Determine the annual interest rate x to the nearest tenth. (4 marks)

```
         500                          704.247                    975.23
7YA  |_____x%_p.a._semi-annual_____|__4YA__11%_p.a._quarterly_____| Now
```

$Now = A_1$ $P_1 = \frac{A_1}{(1+i_1)^{n_1}}$ $P_1 = A_2$ $A = P(1+i)^n$

$4YA = P_1$ $= \frac{975.23}{(1+\frac{0.11}{4})^{3 \times 4}}$ $500 = P_2$ $704.247 = 500\left(1+\frac{x}{200}\right)^{4 \times 2}$

$\frac{0.11}{4} = i_1$ $P_1 = \$704.247$ $4 \times 2 = n_2$ $1.408494 = \left(1+\frac{x}{200}\right)^8$

$3 \times 4 = n_1$ $\frac{x}{100} \div 2 = i_2$ $\sqrt[8]{1.408494} = 1+\frac{x}{200}$

                  ↑ $\frac{x}{200} = i_2$
         3 Decimal Place $\sqrt[8]{1.408494} - 1 = \frac{x}{200}$ 4
         because not final answer

                                            $200 \times \left(\sqrt[8]{1.408494} - 1\right) = x$

∴ the annual interest rate x% $8.748494199 = x$
is approx. 8.7%. (Not accurate $8.7 \cong x$
because rounded to one tenth, will
end up $1975.23 in the end)

/7