TRINITY COLLEGE

Applications Unit 3 & 4
Test 4 2016

Calculator Assumed
Finance

STUDENT'S NAME Solutions

DATE: Thursday 30th June **TIME:** 50 minutes **MARKS**: 47

INSTRUCTIONS:
Standard Items: Pens, pencils, drawing templates, eraser
Special Items: Three calculators, notes on one side of a single A4 page (these notes to be handed in with this assessment)

Questions or parts of questions worth more than 2 marks require working to be shown to receive full marks.

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1. (3 marks)

Luke borrows \$4000 from the bank at a rate of 18% p.a. At the end of each month he pays interest on the amount owing and then makes a repayment. The amount owing to the bank at the end of each month can be defined by the recursive rule.

$$T_{n+1} = AT_n - 300, \quad T_0 = B$$

(a) Determine the value of A. [2]

$A = 1.015$ ✓✓ one mark = 1.18

(b) Determine the value of B. [1]

$B = 4000$ ✓

(c) What is the value of his monthly repayments? [1]

\$300 ✓

4

2. (4 marks)

Mitchell works in a toy shop. He buys a machine which costs $10,000 and makes tin soldiers. Determine the value of the machine, after 5 years, if it has made 700,000 tin soldiers and

(a) the machine depreciates at a rate of 22.5% p.a. [2]

$10\,000 \times 0.775^5 = \$2795.82$ ✓ ✓

(b) the machine depreciates by $450 for every 50,000 tin soldiers made. [2]

$10{,}000 - (14 \times 450) = \$3700$ ✓ ✓

3. (5 marks)

Cooper plans to invest some money in the bank. During his research he found two different offers to choose from: Bank A offers a rate of 7.85% p.a. compounded monthly, while Bank A offers a rate of 7.8% p.a. compounded daily. Compare both loans and determine which bank Cooper should invest his money with.

BANK A

$= 100 \times \left(1 + \frac{0.0785}{12}\right)^{12}$ ✓

$= 108.14$

8.14% ✓

BANK B ✓

$= 100 \times \left(1 + \frac{0.078}{365}\right)^{365}$

$= 108.11$

8.11% ✓

Cooper should invest in bank A with an effective interest rate of 8.14% ✓

4. (6 marks)

Tom borrows $7500 from the bank to buy a scooter. The bank offers terms of 9.9% p.a. compounded monthly. Tom makes a repayment of $700 at the end of each month, the interest is then calculated on the amount owing (after the repayment has been made) and is added to the balance.

(a) Determine the monthly interest rate. [1]

0.825% ✓

(b) Write a recursive formula to determine the balance of the loan at the end of each month. [3]

$T_{n+1} = 1.00825(T_n - 700)$ ✓ ✓

$T_0 = 7500$ ✓

two marks for
$T_{n+1} = 1.00825T_n$
$T_0 = 7500$

(c) At the end of which month will Tom pay off the loan. [1]

11 months = $117.58

∴ the 12th month ✓

(d) Determine the amount of the final repayment which Tom makes. [1]

$117.58 ✓

6

5. (12 marks)

To save money for an overseas holiday, Sam started an investment account. He made an initial deposit of $3000 and then deposited an extra $450 at the end of each month for one year. The table below shows the first four months of the investment, the amount in the account at the beginning of each month (A), the amount of interest accrued in that month (I), the deposit made (D) and the balance at the end of each month.

Month	A	I	D	B
1	3000	37.5	450	3487.5
2	3487.5	x	450	3981.09
3	3981.09	49.76	450	4480.857
4	y	56.01	450	z

(a) Determine the monthly interest rate. [1]

$\frac{37.5}{3000} = 1.25\%$ ✓

(b) Determine the value of x, y and z. [3]

$x = \$43.59$ ✓

$y = \$4480.863$ ✓

$z = \$4986.867$ ✓

(c) Determine the value of the investment after 12 months? [1]

$\$9269.43$ ✓

(d) What was the total amount of interest earnt over the year? [3]

$3000 + (12 \times 450) = 8400$ ✓

$$\begin{array}{r} 9269.43 \\ -\ 8400.00 \\ \hline 869.43 \end{array}$$

(e) If Sam was only able to make payments of $400 per month but he still wished to accrue the same about of money over the year (part c), what would the annual interest rate have to be? [2]

PV = -3000
Repayments = -400
FV = 9269.43
I = ?
N = 12

I = 25.59% p.a

(f) For many investment accounts, interest is calculated daily then instalments are paid into the account monthly. Would this process have given Sam a higher or lower amount of interest over the year? Justify your answer. [2]

PV = -3000
Rep = -450
FV = ?
N = 12
I = 15%

higher ✓

$9275.00
increase by
$5.58 ✓

P/Y = 12
C/Y = 365

6. (16 marks)

Liam takes out a personal loan to purchase a car. The interest for the loan is compounded at the end of each month then a repayment of $1200 is made. The amount owing to the bank at the end of each month can be defined by the recursive rule.

$$A_{n+1} = 1.0084A_n - 1200, \quad T_0 = 67000$$

(a) How much money did Liam borrow? [1]

$67000 ✓

(b) Determine the annual interest rate. [2]

10.08 % p.a. ✓ ✓

(c) Determine the balance of the loan at the end of the

(i) first month [1]

$66362.80 ✓

(ii) sixth month [1]

$63095.61 ✓

(d) Determine the amount of Liam's final repayment. [3]

75 = $801.25 × 1.0084 ✓

76 = $807.98 ✓

8

(e) Determine the amount of interest paid on the entirety of the loan [3]

$75 \times 1200 + 807.98 = \$90807.98$

$- 67000$

$= \$23807.98$

(f) What percentage of the original loan did Liam pay in interest? [2]

$\frac{23807.98}{67000} \times 100 = 35.5\%$

After exactly 5 years, Liam decided he wants to pay the entire loan off by the end of the 6th year.

(g) If the interest rate stays the same, determine the value of the monthly repayments. Liam would need to make during the 6th year to pay the loan off by the end of the 6th year. Justify your answer. [3]

Month 60 = 17 552.63

future value = 0

N = 12

I = 10.08

payment = \$1543.81