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Topic: Mixed Applications of Finance

Time: 45 mins   Marks: /45 marks

Calculator Assumed

Question One: [2, 3, 4, 4: 13 marks]

Sebastian is taking a loan of $15 000 with 12.9% interest per annum compounding weekly (52 weeks in a year). He agrees to pay $200 per month.

a)   During which month will this loan be paid off?

b)   How much interest does Sebastian pay?

c)   How much would he save if all the conditions of the loan remain the same except the interest is compounded monthly?

d)   How much would he save if all the conditions of the loan remain the same except the interest is compounded annually?

Question Two: [2, 3, 2, 3: 10 marks]

Harrison is taking a loan of $12 500 with 10.5% interest per annum compounding annually. He agrees to repay $350 per month.

a)   When will this loan be paid off?

b)   How much interest does Harrion pay?

c)   Show that the amount of money Harrison pays in repayments per year is approximately equal to $81 per week.

d)   How much does Harrison save if he makes weekly repayments?

Question Three: [2, 4: 6 marks]

Jaxon buys a small new car in 2015 for $30 000. The current rate of depreciation of vehicles is 12.9% p.a.

Jaxon takes a loan of $25 000 to buy this car and agrees to pay $400 at the end of each month in repayments. The loan is accumulating interest at a rate of 14.5% p.a compounding monthly.

a) Write the formula which can be used to calculate the value of the car after n years using the rate of depreciation.

b) Compare the value of the car and the size of the loan at the end of each year for the first 4 years of the loan and comment on your findings.

Question Four: [2, 2, 3: 7 marks]

Paris invests $15000 in a fixed term account for 10 years. This investment account accumulates 6.9% interest per annum compounding bi annually. Paris decides to add to the investment each month by adding an additional $200 into the account each month.

a)   What is the balance in the account after the fixed term is finished?

b)   How much interest did she earn in this time?

After the fixed term Paris wants to draw down on the account each month.

c)   If the account continues to earn 6.9% per annum compounding bi annually and she draws $350 per month, for how long can she continue to draw earnings from the account? Explain your answer.

Question Five: [2, 1, 2, 2, 2: 9 marks]

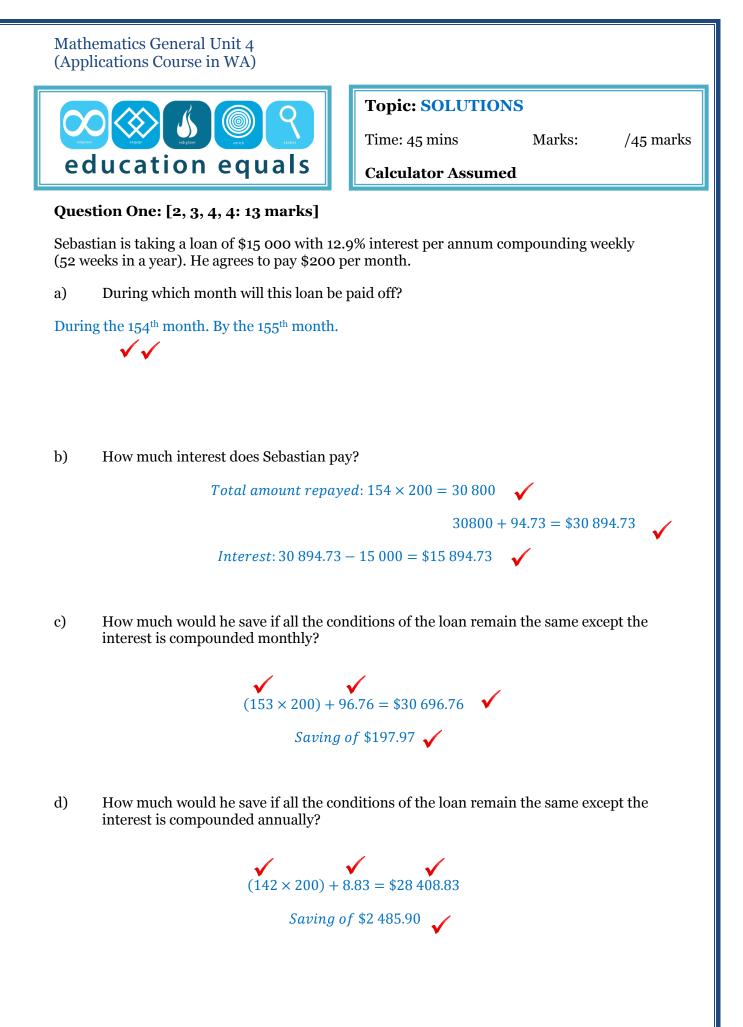Consider the following table showing the balance and growth of an investment month by month.

Month	Balance at the start of the month	Interest	Balance at the end of the month
1	2000	$9.1\dot{6}$	2159.17
2	2159.17	9.90	2319.61
3	2319.61	10.63	2480.24

a)   What is the annual interest on this investment?

b)   How much extra money is invested into the account at the end of each month?

c)   What is the balance at the end of the first 6 months?

Once the balance on this account reaches a certain amount it is intended that it would be set up to serve to fund a perpetual award. No more extra money would be added to the account each month and the interest rate would remain the same.

d)   If the prize is to be an annual award of $282, what does the balance on the account need to be?

e)   How long will it take for the account to reach this amount?

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Question One: [2, 3, 4, 4: 13 marks]

Sebastian is taking a loan of $15 000 with 12.9% interest per annum compounding weekly (52 weeks in a year). He agrees to pay $200 per month.

a)   During which month will this loan be paid off?

During the 154th month. By the 155th month.

b)   How much interest does Sebastian pay?

$$Total\ amount\ repayed: 154 \times 200 = 30\ 800$$

$$30800 + 94.73 = \$30\ 894.73$$

$$Interest: 30\ 894.73 - 15\ 000 = \$15\ 894.73$$

c)   How much would he save if all the conditions of the loan remain the same except the interest is compounded monthly?

$$(153 \times 200) + 96.76 = \$30\ 696.76$$

$$Saving\ of\ \$197.97$$

d)   How much would he save if all the conditions of the loan remain the same except the interest is compounded annually?

$$(142 \times 200) + 8.83 = \$28\ 408.83$$
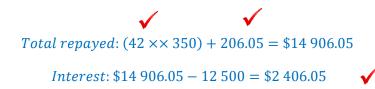
$$Saving\ of\ \$2\ 485.90$$

Question Two: [2, 3, 2, 3: 10 marks]

Harrison is taking a loan of $12 500 with 10.5% interest per annum compounding annually. He agrees to repay $350 per month.

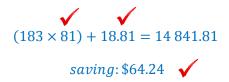a)   When will this loan be paid off?

During the 43 rd month. ✓ ✓

b)   How much interest does Harrion pay?

✓   ✓

$$Total\ repayed: (42 \times\times 350) + 206.05 = \$14\ 906.05$$

$$Interest: \$14\ 906.05 - 12\ 500 = \$2\ 406.05$$ ✓

c)   Show that the amount of money Harrison pays in repayments per year is approximately equal to $81 per week.

$$350 \times 12 = 4\ 200/year$$ ✓

$$\frac{4\ 200}{52} = \$80.77 \sim \$81.00\ per\ week$$ ✓

d)   How much does Harrison save if he makes weekly repayments?

✓   ✓

$$(183 \times 81) + 18.81 = 14\ 841.81$$
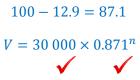
$$saving: \$64.24$$ ✓

Question Three: [2, 4: 6 marks]

Jaxon buys a small new car in 2015 for \$30 000. The current rate of depreciation of vehicles is 12.9% p.a.

Jaxon takes a loan of \$25 000 to buy this car and agrees to pay \$400 at the end of each month in repayments. The loan is accumulating interest at a rate of 14.5% p.a compounding monthly.

a)   Write the formula which can be used to calculate the value of the car after n years using the rate of depreciation.

$$100 - 12.9 = 87.1$$

$$V = 30\,000 \times 0.871^n$$

✓   ✓

b)   Compare the value of the car and the size of the loan at the end of each year for the first 4 years of the loan and comment on your findings.

	Value	Loan	
1	26130	23 743.63	
2	22 759.23	22 292.58	✓
3	19 823.29	20 616.52	✓
4	17 266.09	18 680.61	✓

The size of the loan is more than the value of the car by the end of the 3rd year.   ✓

Question Four: [2, 2, 3: 7 marks]

Paris invests $15000 in a fixed term account for 10 years. This investment account accumulates 6.9% interest per annum compounding bi annually. Paris decides to add to the investment each month by adding an additional $200 into the account each month.

a)   What is the balance in the account after the fixed term is finished?

✓ ✓ $63 803.71

b)   How much interest did she earn in this time?

$$200 \times 120 = 24\,000$$ ✓

$$Interest: 63803.71 - (15\,000 + 24\,000) = \$24\,803.71$$ ✓

After the fixed term Paris wants to draw down on the account each month.

c)   If the account continues to earn 6.9% per annum compounding bi annually and she draws $350 per month, for how long can she continue to draw earnings from the account? Explain your answer.

$$0.069 \div 2 = 0.0345$$

$$After\ 6\ months\ 63\,803.71 - (6 \times 350) = 61\,703.71$$ ✓

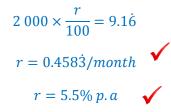$$61\,703.71 \times 1.0345 = 63\,832.49$$ ✓

The interest earned more than covers the drawings ∴ Paris can continue indefinitely. ✓

Question Five: [2, 1, 2, 2, 2: 9 marks]

Consider the following table showing the balance and growth of an investment month by month.

Month	Balance at the start of the month	Interest	Balance at the end of the month
1	2000	$9.1\dot{6}$	2159.17
2	2159.17	9.90	2319.61
3	2319.61	10.63	2480.24

a)   What is the annual interest on this investment?

$$2\,000 \times \frac{r}{100} = 9.1\dot{6}$$

$$r = 0.458\dot{3}/month \quad \checkmark$$

$$r = 5.5\% \, p.a \quad \checkmark$$

b)   How much extra money is invested into the account at the end of each month?

$$2\,159.17 - 2\,009.17 = \$150 \quad \checkmark$$

c)   What is the balance at the end of the first 6 months?

$$\$2\,966.01 \quad \checkmark \checkmark$$

Once the balance on this account reaches a certain amount it is intended that it would be set up to serve to fund a perpetual award. No more extra money would be added to the account each month and the interest rate would remain the same.

d)   If the prize is to be an annual award of \$282, what does the balance on the account need to be?

$$A \times \left(1 + \frac{5.5}{1200}\right)^{12} = A + 282 \quad \checkmark$$

$$A = \$4\,999.31 \quad \checkmark$$

e)   How long will it take for the account to reach this amount?

$$18.104 \, months \quad \checkmark$$

$$\therefore 19 \, months \quad \checkmark$$