

## FINANCE MATHS QUESTIONS SET 2

### Question 1

An investment that earns simple interest can be modelled by the following recursion relation:

$$V_{n+1} = V_n + 2840, V_0 = 40\,000$$

Where  $V_n$  is the value of the investment after  $n$  years.

- a. What was the initial amount invested?

1 mark

- b. What amount of interest was paid each year?

1 mark

- c. Calculate the annual percentage interest rate that the investment was earning. Give your answer correct to one decimal place.

1 mark

### Question 2

Sally has \$4 000 to invest. She deposits this in an account that earns simple interest at the rate of 7% per annum. Her sister, Eva has \$6000 to invest and she deposits in an account that earns 3% per annum simple interest.

- a. Write a recursive relation that gives the value of Sally's investment after  $n$  years.

1 mark

- b. Write a recursive relation that gives the value of Eva's investment after  $n$  years.

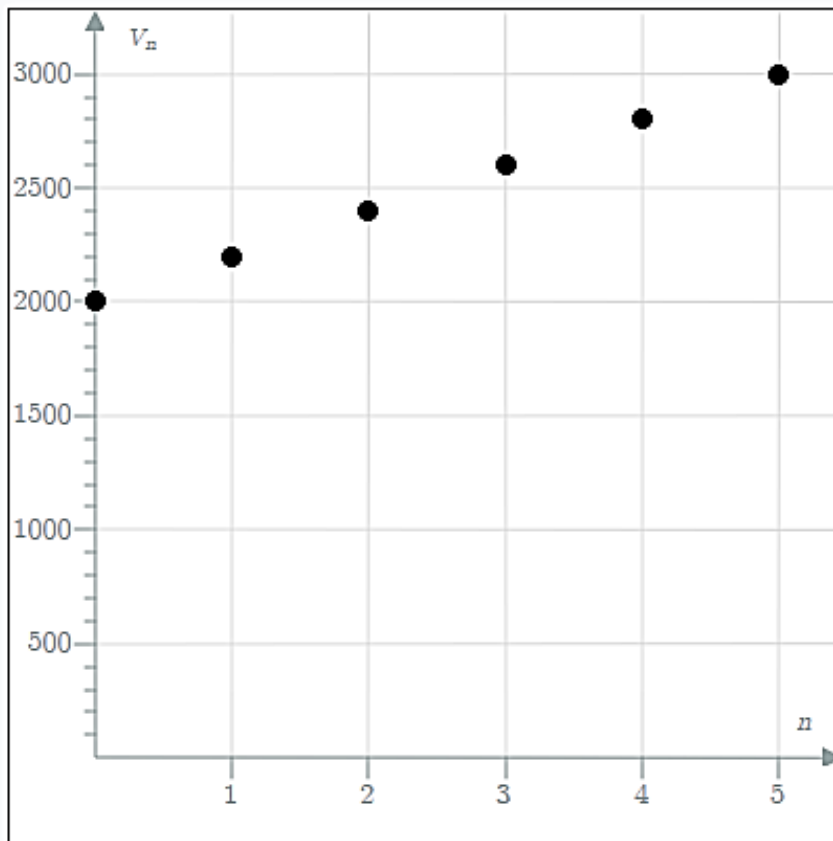
1 mark

- c. Determine the number of years after which Eva's investment will be equal in value to Sally's investment.

2 marks

### Question 3

The value, in dollars, at the end of each year of an investment that pays simple interest annually is graphed below.



- a. Use the graph to determine a recursive relation that gives the value  $V_{n+1}$  of the investment after  $n+1$  years in terms of  $V_n$  and  $V_0$ .

1 mark

- b. What is the annual interest rate?

1 mark

Question 4

\$12 000 is invested in a simple interest account earning interest at 3.6% per annum. Interest is paid at the end of each **month**. No withdrawals or deposits to the account are made.

- a. How much interest is paid each month?

1 mark

- b. Write down a recurrence relation which gives the value  $V_{n+1}$  of the investment after  $n+1$  months, in terms of  $V_n$  and  $V_0$ .

1 mark

- c. At the end of which month does the value of the investment first go past \$20,000 ?

1 mark

**Question 5**

\$3 000 is invested at the beginning of the year in an account that earns 18% per annum compound interest, compounding monthly.

- a. Write down a recursive relation that gives the value  $V_{n+1}$  of the investment after  $n+1$  months, in terms of  $V_n$  and  $V_0$ .

1 mark

- b. Write down a rule that gives the value  $V$  of the investment after  $n$  months.

1 mark

- c. Calculate the value of the investment after 2 years. Give your answer to the nearest cent.

1 mark

**Question 6**

The following spreadsheet shows the balance of a savings account in 2015, where interest is compounded monthly.

	A	B	C	D
1	Month	Balance at beginning of month	Interest	Balance at end of month
2	July	6 000	120	$X$
3	August	6 120	122.40	6 242.40
4	September	6 242.40	$Y$	6 367.25
5	October	$Z$	127.35	6 494.60
6	November	6 494.60	129.89	6 624.49

a. Calculate the value of  $X$ .

1 mark

b. Determine the **annual** interest rate being paid.

1 mark

c. Calculate the value of  $Y$ .

1 mark

d. Write a recursive relation that will give the balance  $B_{n+1}$  after  $n+1$  months in terms of  $B_n$  and  $B_0$ .

1 mark

**Question 7**

\$8 000 is invested in an investment account that pays 6% per annum compound interest, compounded quarterly.

- a. The value  $V_n$  of the investment after  $n$  quarters can be expressed in the form:  
 $V_n = R^n \times V_0$ , where  $V_0 = 8000$  is the initial amount invested.

State the value of  $R$ .

1 mark

- b. Determine the value of the investment at the end of 3 years. Give your answer to the nearest cent.

2 marks

- c. Determine the amount of interest that was earned in the third year. Give your answer to the nearest cent.

2 marks

**Question 8**

James invests \$2000 at 2.3% per annum, compounded daily.

- a. Calculate the amount of interest that he will earn at the end of 1 year, correct to the nearest cent.

1 mark

- b. Hence state the effective annual interest rate, correct to two decimal places.

1 mark

**Question 9**

An investment earns 5.2% per annum compounding quarterly. What is the effective interest rate, correct to two decimal places?

1 mark

**Question 10**

Pauline invests \$190000 at a rate of 12% per annum compounded quarterly. She makes regular withdrawals from the account at the end of each quarter. What is the biggest quarterly withdrawal that Pauline can make if she wants her annuity to last 30 years? Give your answer to the nearest cent.

2 marks

**Question 11**

Valentina invests \$110000 in an annuity that earns 6% per annum, compounding monthly. At the end of each month, she withdraws \$2550 from the account after interest is paid.

- a. Let  $V_{n+1}$  be the value of the annuity at the end of  $n + 1$  months. Write a recursive relation which gives  $V_{n+1}$  in terms of  $V_n$  and  $V_0$ .

1 mark

- b. How long will Valentina's annuity last? Give your answer to the nearest month.

2 marks

**Question 12**

The table below shows the balance in an investment in which regular deposits are made at the end of each year.

Year	Beginning Balance	Interest	Deposit	End Balance
1	$y$	180	700	9 880
2	9 880	197.60	700	10 777.60
3	10 777.60	$x$	700	11 693.15
3	11 693.15	233.86	700	$w$

a. i. Determine the value of  $w$

ii. Determine the value of  $x$ .

iii. Determine the value of  $y$ .

3 marks

b. Calculate the annual interest rate.

1 mark

c. Write a recursive relation which gives  $V_{n+1}$  in terms of  $V_n$  and  $V_0$ , where  $V_n$  is the value of the investment after  $n$  years.

1 mark

d. The total amount of the investment is withdrawn after 25 years. Calculate the total amount of **interest** earned over these 25 years. Give your answer to the nearest cent.

2 marks

**Question 13**

To save up for a car, Gwen opens up a savings account that earns 5% per annum, compounding monthly. She initially deposits \$1 400 in the account at the beginning of the first month, and then deposits \$195 at the end of each month. Calculate the amount of money that Gwen will have in her savings account at the end of 3 years. Give your answer to the nearest cent.

2 marks

**Question 14**

Tara needs to save \$71 000 to start a small business. A bank offers her a savings account for this purpose, offering 14 % per annum, compounded monthly. Tara will initially deposit \$6000 and can afford to contribute \$900 to the account at the end of every month. How long, to the nearest month, will it take for Tara to achieve her goal?

2 marks

**Question 15**

Ray is saving for a deposit to buy a house. He can initially afford to deposit \$14 000 in a savings account thanks to a donation from his parents, and then will make regular deposits of \$1 100 at the end of each month. Calculate annual interest rate he will require to achieve a target of \$80 000 in savings at the end of 4 years, if interest is compounded monthly. Give your answer correct to two decimal places.

2 marks



**Question 16**

Robert has just won a \$300 000 lottery and decides to invest in a perpetuity that pays 6% per annum, compounding monthly.

a. What monthly payment will Robert receive?

1 mark

b. What will be the balance in his perpetuity at the end of 3 years?

1 mark

**Question 17**

Eric wants to set up a scholarship where the top student each year receives a prize of \$8 000. If the interest on the initial investment averages 2% per annum, compounding annually, how much should his initial investment be?

1 mark



### Question 19

Jack takes out a reducing balance loan of \$100 000. The following table lists his first few repayments, and shows how much of each repayment was interest, and how much went to reducing the principal:

Starting balance (before any repayment): \$100, 000

Period	Interest	Principal	Balance
1	\$583.33	\$191.97	\$99,808.03
2	\$582.21	\$193.09	\$99,614.95
3	\$581.09	\$194.21	\$99,420.74
4	\$579.95	\$195.34	\$99,225.39
5	\$578.81	\$196.48	\$99,028.91
6	\$577.67	\$197.63	\$98,831.28
7	\$576.52	\$198.78	\$98,632.50
8	\$575.36	\$199.94	\$98,432.55
9	\$574.19	\$201.11	\$98,231.44
10	\$573.02	\$202.28	\$98,029.16
11	\$571.84	\$203.46	\$97,825.70
12	\$570.65	\$204.65	\$97,621.05

a. How much does Jack pay each month as his regular repayment?

a. What is the annual interest rate being charged?

b. How much of Jack's 25<sup>th</sup> repayment will go towards reducing the principal? Give your answer to the nearest cent.

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d. At the end of which month will Jack make his final repayment?

e. What is the value of his final repayment, correct to the nearest cent?

f. Correct to the nearest dollar, how much interest does Jack pay on this loan?