TOPIC TEST

Loans and annuities

- Time allowed: 45 minutes
- Part A: 20 multiple-choice questions (20 marks)
- Part B: 7 free-response questions (30 marks)
- Total: 50 marks

Part A

20 multiple-choice questions
1 mark each: 20 marks
Circle the correct answer

1 Convert an interest rate of 5.4% p.a. to a monthly rate as a decimal.

A 0.0054 **B** 0.45

C 0.0045 **D** 0.045

2 Lucinda borrows $1 320 000. The interest charged for the first month of the loan is $6160. Her monthly repayments are $8430. How much does she owe at the end of the first month, after she has made her first repayment?

A $1 317 730

B $1 317 820

C $1 321 820

D $1 322 270

3 Jingru borrows $867 000 to buy a house.

Interest is charged at 5.2% per annum, compounded monthly. How much does she owe at the end of the first month, after she has made a $4500 repayment?

A $858 743

B $866 401.50

C $907 584

D $866 257

4 What is the total interest payable on a reducing balance loan of $695 000 at 5.5% p.a. over 11 years, with fortnightly repayments of $3704.60?

A $283 014.40

B $323 765

C $364 515.60

D $460 835.20

5 Louis borrowed $424 000 at 6.36% p.a. with monthly repayments. The balance owing after one month is $423 402.20. What is the monthly repayment?

A $2844

B $2845

C $3043

D $27 564.20

6 Henry is charged 0.03% compound interest per day on his credit card purchase of $1400.

Which of the following expressions shows the amount of interest owing after 30 days?

A $1400(1.0003)^{30}$

B $1400(1.03)^{30} - 1400$

C $1400(1.0003)^{30} - 1400$

D $1400 \times 0.0003 \times 30$

7 Interest charged on an NCM credit card includes the date of purchase, but not the date of payment. How many days interest will be charged on a purchase made by credit card on 22 December and paid on 8 February?

A 47 **B** 46

C 49 **D** 48

8 What is an annual interest rate of 22% converted to a daily rate, correct to 3 significant figures?

A 0.060%

B 0.0603%

C 0.0602%

D 0.0601%

9 A credit card has a 55-day interest-free period. Part of a monthly statement is shown below.

Statement period: 1 April to 30 April
Daily compound interest rate: 0.06%

Date	Purchase	Amount
7 April	Ukulele	$940

Full payment was made on 28 May.
What compound interest will be charged?

A $1.69 **B** $28.20

C $28.76 **D** $29.33

10 An annuity is an investment involving:

A regular equal contributions made at the start of each compounding period

B regular equal contributions made at the end of each compounding period

C a single lump sum payment

D irregular variable contributions made at the start of each compounding period.

Questions 11 and 12 refer to this table that shows an annuity in its third year.

Year	Balance at start of year, P	Interest, I	Contribution at end of year, a	Balance at end of year, $P + I + a$
3	$1845	$92.25		$2837.25

11 What is the annual interest rate?

A 3.25% **B** 0.05%

C 5% **D** 0.325%

12 What is the value of the contribution made at the end of the 3rd year?

A $900 **B** $600

C $1845 **D** $184.50

Use this table of future value interest factors for questions 13, 14 and 15.

Period	1%	2%	3%	4%	5%
3	3.0301	3.0604	3.0909	3.1216	3.1525
4	4.0604	4.1216	4.1836	4.2465	4.3101

13 Calculate the future value of an annuity with a contribution of $350 at the end of each year for 3 years at 4% p.a. compounded annually.

A $1081.82

B $1092.56

C $1464.26

D $1486.28

14 Calculate the future value of an annuity with a contribution of $820 per quarter for 1 year at 8% p.a. compounded quarterly.

A $2509.53 **B** $2559.71

C $3379.71 **D** $3482.13

15 Find the contribution per period of an annuity whose future value is $35 351.42, at 6% p.a. compounded half-yearly for 2 years.

A $8577 **B** $8540

C $8450 **D** $8202

This table gives the monthly repayment for a reducing-balance loan per $1000 borrowed. Use it for questions **16**, **17** and **18**.

Rate (% p.a.)	Term (years) 5	10	15	20
4.5	$18.64	$10.36	$7.65	$6.33
5	$18.87	$10.61	$7.91	$6.60
5.5	$19.10	$10.85	$8.17	$6.88
6	$19.33	$11.10	$8.44	$7.16
7	$19.80	$11.61	$8.99	$7.75

16 What is the monthly repayment on a $395 200 loan at 5.5% p.a. for 20 years?

A $2718.98

B $2608.32

C $3228.78

D $2717.60

17 Find the total amount repaid on a $231 000 loan at 4.5% p.a. over 20 years.

A $292 446

B $350 935.20

C $381 427.20

D $424 116

18 How much interest is paid on a reducing-balance loan for $20 000 at 7% p.a. over 10 years?

A $3220

B $6640

C $7864

D $27 520

19 An early termination fee for a car loan is $50 plus a pro-rata fee of

$$\frac{\text{Months remaining on loan}}{\text{Total months of loan}} \times \$680.$$

Calculate the early termination fee on a 5-year loan terminated after 3.5 years.

A $68

B $106.67

C $118

D $135

20 These are the upfront charges for a home loan of $629 000.

• Mortgage registration	$139
• Registration of transfer	$139
• Establishment fee	$600
• Lender mortgage insurance	$8140
• Stamp duty	$23 795

Calculate the upfront charges as a percentage of the home loan, correct to 1 decimal place.

A 5.1%

B 5.2%

C 5.3%

D 5.4%

Part B

7 free-response questions
30 marks
Show working where appropriate

21 This table shows the progress of a $39 400 reducing balance personal loan with 14.56% p.a. interest and weekly repayments of $220, over the first 3 weeks.

Week (n)	Principal (P)	Interest (I)	$P+I$	$P+I-R$
1	$39 400	$110.32	$39 510.32	$39 290.32
2	$39 290.32	$	$	$
3	$	$	$	$

a Complete the table.

b How much interest has been charged in the first 3 weeks? _____

c How much has been paid off the loan after 3 weeks? _____

d What percentage (to the nearest whole number) of the repayments made reduced the principal?

_____

[7 marks]

22 Bernie borrowed $12 000 for a holiday. The interest charged was $1318.10. He made monthly repayments of $392.31, apart from the last repayment, when only $371.87 was required. What was the duration of the loan? Answer in years and months.

_____

[3 marks]

23 Jack's November credit card statement is shown below.

Jack Russell

Due date: 30 November

Previous balance	Payments	Purchases	Interest
$706.40	$706.40	$568	

Date	Purchases	Amount	Closing Balance
12 November	Last Resort Kennels	$568	

Daily flat percentage rate: 0.0575%

Interest charges include both the date of purchase and the payment date.

Minimum payment due: $25 or 5% of the closing balance, whichever is larger.

a Calculate the interest on the purchase. _____

b What is the total amount owing? _____

c What is the minimum payment due on this account?

_____

[4 marks]

24 Sophie invests $2000 every quarter for 2 years, at 6% p.a. compounded quarterly.

a Use this table of future value interest factors to find the future value of the annuity.

Future value interest factors
(Future value of an annuity with a contribution of $1 at the end of each period)

Period	Interest rate per period									
	0.25%	0.50%	0.75%	1.00%	1.50%	2.00%	2.50%	3.00%	4.00%	5.00%
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	2.0025	2.0050	2.0075	2.0100	2.0150	2.0200	2.0250	2.0300	2.0400	2.0500
3	3.0075	3.0150	3.0226	3.0301	3.0452	3.0604	3.0756	3.0909	3.1216	3.1525
4	4.0150	4.0301	4.0452	4.0604	4.0909	4.1216	4.1525	4.1836	4.2465	4.3101
5	5.0251	5.0503	5.0756	5.1010	5.1523	5.2040	5.2563	5.3091	5.4163	5.5256
6	6.0376	6.0755	6.1136	6.1520	6.2296	6.3081	6.3877	6.4684	6.6330	6.8019
7	7.0527	7.1059	7.1595	7.2135	7.3230	7.4343	7.5474	7.6625	7.8983	8.1420
8	8.0704	8.1414	8.2132	8.2857	8.4328	8.5830	8.7361	8.8923	9.2142	9.5491
9	9.0905	9.1821	9.2748	9.3685	9.5593	9.7546	9.9545	10.1591	10.5828	11.0266
10	10.1133	10.2280	10.3443	10.4622	10.7027	10.9497	11.2034	11.4639	12.0061	12.5779
11	11.1385	11.2792	11.4219	11.5668	11.8633	12.1687	12.4835	12.8078	13.4864	14.2068
12	12.1664	12.3356	12.5076	12.6825	13.0412	13.4121	13.7956	14.1920	15.0258	15.9171

_____

b Use the formula $PV = \frac{FV}{(1+r)^n}$ to calculate what single sum of money she could have invested, for 2 years at 3% p.a. compounded quarterly, to reach the future value determined in part **a**.

_____

[4 marks]

25 Monthly repayments on a reducing balance loan of $80 000 over 15 years are $787.80.

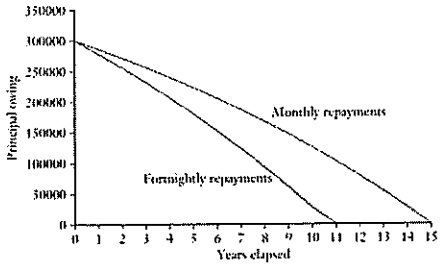
Monthly repayments on the same loan over 17 years are $742.64. How much interest is saved by taking out the loan for the shorter term?

[4 marks]

26 Monthly repayments on a $20 000 loan over 18 months are $1213. Fortnightly repayments on the same loan for the same time are $559. Which loan method is cheaper and by how much?

[4 marks]

27 The graph shows the progress of a $300 000 loan for monthly and fortnightly repayments.



a What was the difference in the amount owing after 9 years? Answer to the nearest $5000.

b How long did it take for the loan with the fortnightly repayments to reduce the principal by half?

c After how many monthly repayments had $60 000 been paid off the loan?

[4 marks]

This is the end of the test.

Answers

Part A

1 C	2 A	3 D	4 C	5 B
6 C	7 D	8 B	9 C	10 B
11 C	12 A	13 B	14 C	15 C
16 A	17 B	18 C	19 C	20 B

Part B

21 a

Week (n)	Principal (P)	Interest (I)	$P+I$	$P+I-R$
1	$39 400	$110.32	$39 510.32	$39 290.32
2	$39 290.32	$110.01	$39 400.33	$39 180.33
3	$39 180.33	$109.70	$39 290.03	$39 070.03

b $330.03 c $329.97 d 50%

22 2 years 10 months

23 a $6.21 b $574.21 c $28.71

24 a $16 865.60 b $15 886.98

25 $9694.56

26 Fortnightly, $33

27 a $85 000 b 6 years c 48