MARKING GUIDELINE

MARKS	DURATION	QUESTIONS
37	1 hour	3

Name: ..... Class: .....

Date: .....

MARK ____ / 37

INSTRUCTIONS AND INFORMATION

1. Answer **ALL** the questions in this question paper.
2. Answer QUESTION 1 by **circling** the letter (A–D) in the answer grid at the end of that section.
3. Show **ALL** calculations clearly.
4. Show all units where applicable.
5. Number the answers correctly according to the numbering system used in this question paper.
6. A non-programmable calculator may be used, unless stated otherwise.
7. Write neatly and legibly.

QUESTION 1 [10 MARKS]

Four options are given as possible answers to the following questions. Choose the correct answer and circle the letter (A–D) in the grid at the end of this section. If you want to change your choice, put a cross through the wrong letter and circle your new choice.

1.1 The FUTURE VALUE annuity formula is ... (1)

A) $\frac{x}{i}$

B) $\frac{x[(1+i)^n - 1]}{i}$ ✓

C) $\frac{x[1-(1+i)^{-n}]}{i}$

D) $x(1+i)^n$

Answer: B — F is the value BUILT UP by a series of regular deposits.

- **A** — it leaves out the growth factor $[(1+i)^n - 1]$, so it cannot be the future value
- **C** — that is P, the PRESENT value formula, which is used for loans
- **D** — that grows a single lump sum, not a series of deposits

1.2 The PRESENT VALUE annuity formula is the one to use for ... (1)

A) a simple interest calculation

B) a single lump-sum investment

C) a savings plan with monthly deposits

D) **a loan repaid in equal instalments** ✓

Answer: D — P is the amount borrowed today, repaid by a series of future payments.

- **A** — annuities always use compound interest
- **B** — a lump sum uses $A = P(1+i)^n$
- **C** — that is the FUTURE value formula's case

1.3 A loan is repaid MONTHLY over 20 years at 11% p.a. compounded monthly. Then ... (1)

A) **$n = 240$ and $i = 0{,}11 \div 12$ ✓** **B)** $n = 20$ and $i = 0{,}11 \div 12$

C) $n = 240$ and $i = 0{,}11$ **D)** $n = 20$ and $i = 0{,}11$

> **Answer: A** — Both n and i must be expressed in the SAME period, here months.
> - **B** — the rate was converted but the periods were left in years
> - **C** — the periods were converted but the rate was left annual
> - **D** — those are the annual values, but the payments are monthly

1.4 A tractor bought for R980 000 depreciates at 9,2% p.a. on the REDUCING BALANCE. Its book value after 7 years is ... (1)

A) R348 880 **B)** **R498 686 ✓**

C) R889 840 **D)** R666 146

> **Answer: B** — $A = P(1 - i)^n = 980\,000(0{,}908)^7$.
> - **A** — used the STRAIGHT-LINE method: $980\,000(1 - 7 \times 0{,}092)$
> - **C** — depreciated for one year only
> - **D** — depreciated for four years instead of seven

1.5 A fixed amount is deposited at the END of each month for 60 months at 8,35% p.a. compounded monthly, reaching R450 000. The monthly deposit is about ... (1)

A) R76 172 **B)** R9 200

C) R7 500 **D)** **R6 069 ✓**

> **Answer: D** — $450\,000 = x[(1 + i)^{60} - 1] \div i$ with $i = 0{,}0835 \div 12$, so $x \approx$ R6 069.
> - **A** — treated the 60 monthly deposits as 5 annual ones
> - **B** — used the PRESENT value formula instead of the future value one
> - **C** — divided 450 000 by 60, ignoring the interest altogether

1.6 The OUTSTANDING BALANCE on a loan is found by ... (1)

A) **taking the present value of the payments still to be made** ✓ **B)** taking the future value of the payments already made

C) multiplying the instalment by the number of payments left **D)** subtracting the payments already made from the amount borrowed

> **Answer: A** — The balance is what the remaining payments are worth TODAY.
> - **B** — the future value of past payments is a savings calculation, not a balance
> - **C** — that totals the future payments without discounting them
> - **D** — that ignores the interest that has accrued on the balance

1.7 The total INTEREST paid on a loan equals ... (1)

A) the amount borrowed multiplied by the rate **B)** the instalment multiplied by the rate

C) **the total of all the instalments minus the amount borrowed** ✓ **D)** the outstanding balance

> **Answer: C** — Everything paid above the principal is interest.
> - **A** — that gives one period's interest on the original amount only
> - **B** — an instalment already contains both interest and capital
> - **D** — the balance is what is still owed, not what has been paid in interest

1.8 A loan of R1 050 000 at 12% p.a. compounded monthly over 25 years has a monthly instalment of about ... (1)

A) R11 561 **B)** R10 500

C) R11 059 ✓ **D)** R3 500

> **Answer: C** — $x = Pi \div [1 - (1 + i)^{-n}]$ with $i = 0{,}01$ and $n = 300$.
> - **A** — used 20 years instead of 25
> - **B** — gave the first month's interest only
> - **D** — divided the loan by 300 months, ignoring all the interest

1.9 If the FIRST repayment is made 6 months after a loan is granted, the loan amount must first be ... (1)

A) divided by the number of deferred months **B)** left exactly as it is

C) reduced by the deferred months' interest **D) grown by compound interest over those deferred months** ✓

> **Answer: D** — Interest accrues during the payment holiday, so the balance when payments start is larger.
> - **A** — dividing has no financial meaning here
> - **B** — leaving it unchanged ignores the interest that accrued
> - **C** — the balance GROWS during a payment holiday; it does not shrink

1.10 R12 000 grows to R13 459 in 24 months at m% p.a. compounded QUARTERLY. Then m is about ... (1)

A) 12,16% **B) 5,78%** ✓

C) 1,44% **D)** 5,90%

> **Answer: B** — $(1 + i)^8 = 13\,459 \div 12\,000$ gives $i = 0{,}014446$ per quarter, and $m = 4i = 5{,}78\%$.
> - **A** — that is the total percentage growth over the two years
> - **C** — that is the QUARTERLY rate, not the annual one
> - **D** — used 2 annual periods instead of 8 quarterly ones

ANSWER GRID — MARKING GUIDELINE

1.1	A	**(B)**	C	D
1.2	A	B	C	**(D)**
1.3	**(A)**	B	C	D
1.4	A	**(B)**	C	D
1.5	A	B	C	**(D)**
1.6	**(A)**	B	C	D
1.7	A	B	**(C)**	D
1.8	A	B	**(C)**	D
1.9	A	B	C	**(D)**
1.10	A	**(B)**	C	D

QUESTION 2 [14 MARKS]

Thabo wants to save R450 000 as a deposit for a house. He deposits a fixed amount at the END of every month into an account earning 8,35% p.a., compounded monthly. He makes 60 deposits.

2.1 Write down the values of i and n, and explain why i is not simply 0,0835. **(3)**

$i = \frac{0{,}0835}{12}$ *(1)*

$n = \mathbf{60}$ *(1)*

The deposits are made MONTHLY, so the rate in the formula must be the rate per month, not the rate per year *(1)*

2.2 Calculate the monthly deposit. **(4)**

$\text{F} = \frac{x[(1+i)^n - 1]}{i}$ *(1)*

$450\,000 = \frac{x[(1{,}006958)^{60} - 1]}{0{,}006958}$ *(2)*

$x = \mathbf{R6\,068{,}69}$ *(1)*

2.3 Thabo buys a house for R1 500 000 using the R450 000 as a deposit. Write down the value of the loan, and the percentage of the purchase price that he still owes. **(3)**

Loan = R1 500 000 − R450 000 *(1)*

= **R1 050 000** *(1)*

$\frac{1\,050\,000}{1\,500\,000} \times 100 = \mathbf{70\%}$ *(1)*

2.4 The loan is taken at 12% p.a. compounded monthly over 25 years, and the monthly instalment is R11 058,85. Calculate the balance outstanding after 21 years. **(4)**

48 instalments remain *(1)*

Balance = $\frac{11\,058{,}85[1 - (1{,}01)^{-48}]}{0{,}01}$ *(2)*

= **R419 948,32** *(1)*

QUESTION 3 [13 MARKS]

Thabo plans to buy a car costing R250 000. He pays a deposit of 15% and takes a loan for the balance at 13% p.a., compounded monthly.

3.1 Calculate the deposit Thabo pays, and hence the value of the loan. **(3)**

Deposit = 15% of R250 000 *(1)*

= **R37 500** *(1)*

Loan = R250 000 − R37 500 = **R212 500** *(1)*

3.2 The FIRST repayment is made 6 months after the loan is granted, and the loan is repaid over 6 years from the date it was granted. Calculate the amount owing ONE MONTH BEFORE the first repayment, that is, after 5 months. **(3)**

The present-value formula needs the balance one period before the first payment: 5 months of interest *(1)*

$212\,500(1 + \frac{0{,}13}{12})^5$ *(1)* = **R224 262,53** *(1)*

3.3 Hence calculate the monthly instalment. **(5)**

Payments run from month 6 to month 72, so $n = 67$ *(2)*

$\text{R}224\,262{,}53 = \dfrac{x[1 - (1{,}010833)^{-67}]}{0{,}010833}$ *(2)*

$x = \textbf{R4 724,96}$ *(1)*

3.4 Explain why deferring the first repayment makes the loan more expensive. **(2)**

Interest keeps being added while nothing is being repaid *(1)*, so the amount the instalments must cover is larger *(1)*

TOTAL: 37 marks

This question paper consists of 3 questions.

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