Financial Mathematics: exam practice

10 questions · 32 marks · worked solutions and markschemes

Name _____ Date _____ Score / 32

- Answer every question before you look at the solutions. They start after the last question, with the marks for each line: M for method, A for accuracy, R for reasoning.
- Online, with more practice: ibmathrevision.com/hlai/financial-mathematics-exam-practice

1. **2 marks · Paper 1 style · calculator allowed**

$\$3000$ is invested at 5% simple interest per year.

Find the interest after 4 years and the total value. **[2]**

2. **2 marks · Paper 2 style · calculator allowed**

An investment of $\$5000$ grows to $\$7200$ in 8 years, with interest compounded annually.

Find the annual interest rate. **[2]**

3. **3 marks · Paper 2 style · calculator allowed**

Two banks offer 3.8% per year compounded annually, and 3.75% per year compounded monthly.

Find the effective annual rate of the second offer and state which is better for a saver. **[3]**

4. **3 marks · Paper 2 style · calculator allowed**

A house worth $\$320\,000$ increases in value by 3% per year, while inflation is 2.2% per year.

Find the real value of the house after 5 years, in today's money. **[3]**

5. **3 marks · Paper 2 style · calculator allowed**

An annuity pays $\$1500$ at the end of each month for 15 years. The fund earns 5% per year, compounded monthly.

Find the amount that must be invested at the start. **[3]**

6. **3 marks · Paper 2 style · calculator allowed**

Sofia saves $\$250$ at the end of each month in an account paying 3.6% per year, compounded monthly.

Find the value of her savings after 10 years. **[3]**

7. **4 marks · Paper 2 style · calculator allowed**

A car costs $\$28\,000$. Leo pays a deposit of $\$4000$ and borrows the rest at 7.2% per year, compounded monthly, over 4 years.

Find his monthly payment and the total cost of the car. **[4]**

8. **4 marks · Paper 2 style · calculator allowed**

Ben takes a loan of $\$15\,000$ at 6% per year, compounded monthly, repaid by equal monthly payments over 5 years.

(a) Find the monthly payment. **[2]**

(b) Find the total interest paid. **[2]**

9. **4 marks · Paper 2 style · calculator allowed**

$€8000$ is invested at a nominal rate of 4.2% per year, compounded quarterly.

(a) Find the value after 6 years. **[2]**

(b) Find the number of complete years until the value first exceeds $€12\,000$. **[2]**

10. **4 marks · Paper 2 style · calculator allowed**

A mortgage of $\$240\,000$ is taken over 25 years at 4.5% per year, compounded monthly.

(a) Find the monthly repayment. **[2]**

(b) Find the amount still owed after 10 years. **[2]**

Answers and worked solutions

Question 1 — 2 marks

Answer: $\$600$; $\$3600$

$3000 \times 0.05 \times 4 = \$600$ **A1**

$\$3600$ **A1**

Question 2 — 2 marks

Answer: 4.66%

$5000(1+r)^8 = 7200$ **M1**

4.66% **A1**

Question 3 — 3 marks

Answer: 3.815%; the second offer

$\left(1+\frac{0.0375}{12}\right)^{12} - 1$ **M1**

3.815% **A1**

the second offer **A1**

Question 4 — 3 marks

Answer: $\$332\,720$

real rate $\approx \frac{1.03}{1.022} - 1$ **M1**

$320000\left(\frac{1.03}{1.022}\right)^5$ **A1**

$\$332\,720$ **A1**

Question 5 — 3 marks

Answer: $\$189\,683$

GDC: $N = 180$, $I\% = 5$, $PMT = 1500$, $FV = 0$ $M1$ **A1**

$\$189\,682.86$ **A1**

Question 6 — 3 marks

Answer: $\$36\,046.43$

GDC: $N = 120$, $I\% = 3.6$, $PMT = -250$, $PV = 0$ $M1$ **A1**

$\$36\,046.43$ **A1**

Question 7 — 4 marks

Answer: $\$576.94$; $\$31\,693.12$

$PV = 24000$, $N = 48$ **M1**

$\$576.94$ **A1**

$4000 + 48 \times 576.94$ **M1**

$\$31\,693.12$ **A1**

Question 8 — 4 marks

Answer: (a) $\$289.99$; (b) $\$2399.40$

(a)

GDC: $N = 60$, $I\% = 6$, $PV = 15000$, $P/Y = C/Y = 12$ **M1**

$\$289.99$ **A1**

(b)

$60 \times 289.99 - 15000$ **M1**

$\$2399.40$ **A1**

Question 9 — 4 marks

Answer: (a) €$10\,279.25$; (b) 10

(a)

$8000\left(1+\frac{0.042}{4}\right)^{24}$ **M1**

€$10\,279.25$ **A1**

(b)

$n \approx 9.7$ **M1**

10 years **A1**

Question 10 — 4 marks

Answer: (a) $\$1334.00$; (b) $\$174\,380$

(a)

GDC **(M1)**

$\$1334.00$ **A1**

(b)

GDC with $N = 120$ **M1**

$\$174\,380.04$ **A1**

Every solution is also on ibmathrevision.com/hlai/financial-mathematics-exam-practice
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